Metal Finishing

POLISHING AND BUFFING · BARREL FINISHING · CLEANING
PLATING · ANODIZING · RUST PROOFING · LACQUERING & ENAMELING

MAY, 1961

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Read and pass on—

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PLATING POWER BY DC POWER SPECIALISTS

QUALITY

is a big word at RAPID ELECTRIC

Mathematical Design from Scripta Mathematica

From engineering design and development to final production and shipment RAPID maintains strict control over its quality.

Here's how:

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3. Skillful engineering is behind skilled production workers whose years of experience is combined with the latest precision shop equipment and test facilities.

Whether your next rectifier is customed to your needs or a standard line model, if it's a RAPID it will be distinctively different. Call your local RAPID distributor (name available upon request.)

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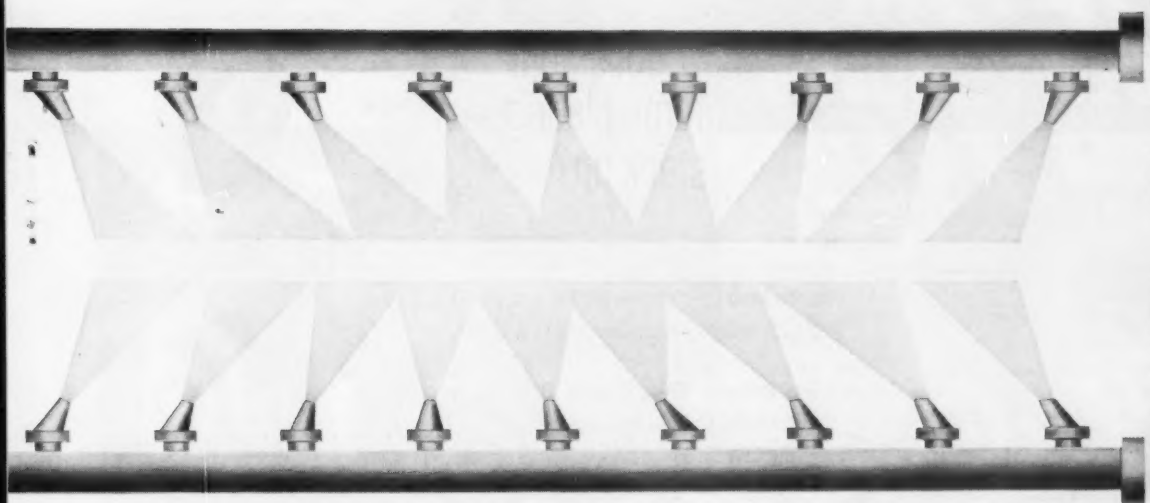
PLANTS: (4) NEW YORK, N.Y. • GRAYSBRIDGE ROAD, BROOKFIELD, CONN.

spray wash clean



with new low-foam SPREAN

SPREAN 66

In new Sprean 66, excessive foaming has been eliminated without sacrificing cleaning ability. The head of foam in the reservoir tank seldom exceeds 1/2" in height — even when high pressures are used. Sprean 66, a high detergency, alkaline compound for cleaning steel, copper, brass and aluminum, has this unsurpassed combination of advantages:

- **Low, constantly controlled foam level.**
- **Removes difficult drawing compounds, oil, solid dirt, shop soil.**
- **Inhibits rust on steel parts.**
- **Prevents scale build-up on tank walls, pipes, nozzles, steam coils.**
- **Free flowing, non-dusting, excellent detergency.**
- **Effective in all equipment: pressure spray, cylindrical screw conveyor, agitated basket-type.**
- **Cleans a variety of different metals.**
- **Has long life, is economical to use.**

To increase the efficiency and economy of your spray wash cleaning operations, write today for complete information on Sprean 66 and the name of your Enthone representative to: Enthone, Inc., 442 Elm Street, New Haven 8, Connecticut.

ANOTHER PRODUCT OF *Enthonics* RESEARCH

ENTHONE

A Subsidiary of American Smelting and Refining Company ASARCO

BUSTLE-BOUND or FAST 'N' SMOOTH

how does your chrome plating stack up?

You can keep your chrome-plating process in step with today — with Diamond CPA 1800®.

For example: Viking Copper Tube Co., of Cleveland, Ohio — with mandrels plated by the CPA 1800 process — draws 1500 feet of copper tubing per minute to extremely close tolerances with almost unbelievably reduced deterioration in machine tools!

This same job-proven additive is available to you. To increase plating speed and covering power. To allow a broader operating range. To simplify anoding and produce a brighter, harder coating. To improve the metallurgical characteristics of chromium plate.

In short: Diamond CPA 1800 can cut your unit costs and save you money. Diamond developed it. Your Diamond CPA 1800 Distributor can supply it where and when you need it.

For further information write or call Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio.

Diamond Chemicals

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For better and more profitable

METAL FINISHING

RELIANCE RECTIFIERS

Standard units or specially designed to meet your individual requirements. Units can be supplied with 4 voltage ranges without current interruption.

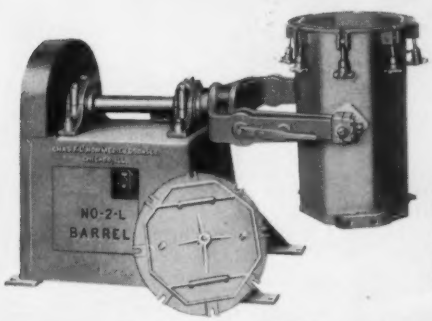
63 years of experience

manufacturing RELIANCE plating and polishing equipment and supplies

In metal finishing, the equipment you use is sure to govern the degree of quality you get in your finished work. That's why so many plant operators favor L'Hommedieu metal finishing units . . . top notch performers in every respect because they're backed up by 63 years of "know-how" in the building of quality-producing, time-saving machines for the metal finishing industry.

RELIANCE PLATING BARRELS

Designed to save time and labor. Cylinders constructed of warp-free Hard Rubber, Plexiglas or Bakelite. Can be loaded with motor running.

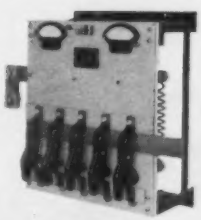


RELIANCE BURNISHING BARRELS

Revolves at a horizontal position or can be set at an angle to give you a flip-flop double tumbling action.

RELIANCE TANK RHEOSTATS

Simple and rugged construction. Self cleaning contact brushes keeps surface clean.



Manufacturers of Metal Finishing Equipment and Supplies

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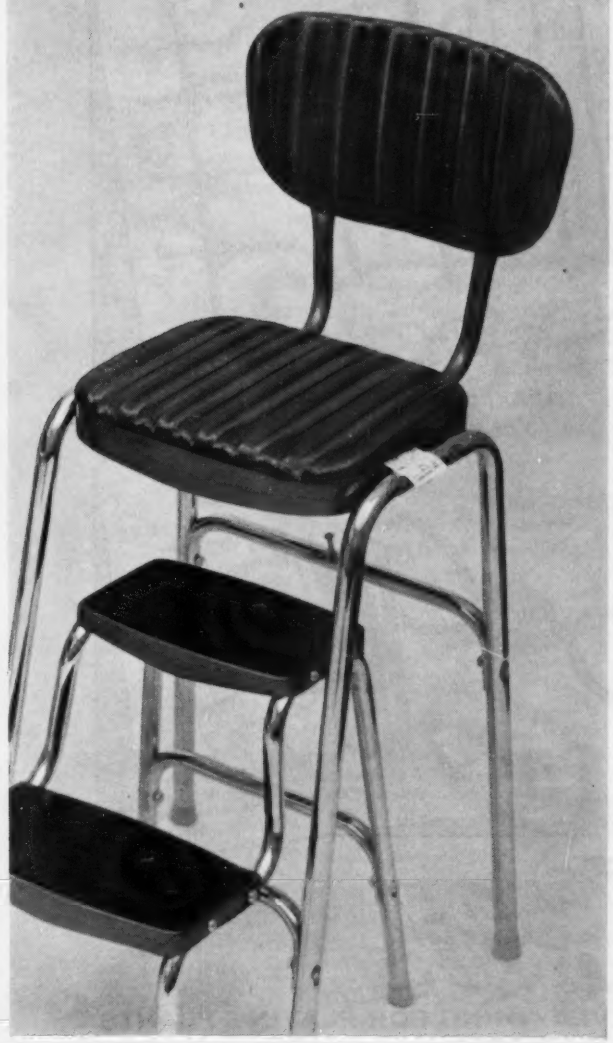
SHOP BULLETIN F60-17
Discontinuation
Polishing & Buffing Operations
August 8, 1960
Effective immediately all polishing and buffing operations on AMES MAID items, prior to plating, are to be discontinued.
C.D. Memel

Ames said goodbye completely to polishing and buffing when SUPERLUME came along

Ray Schlotterbeck exhibits a few Ames products plated with Superlume. Above him, another testimonial to Superlume's superiority . . . Shop Bulletin F60-17.



Reports RAY SCHLOTTERBECK,
Plating Superintendent for the world's largest maker of Shovels and Garden Tools (since 1774), as well as famous AMES MAID and AMES AIRE Tubular Furniture.

One month after Superlume bright nickel bath went into operation at O. Ames Company, Parkersburg, W. Va., the official bulletin shown declared *all* polishing and buffing there no longer necessary.

Ames had been polishing 5000-6500 parts a day, first switched to Superlume just to give its products added eye-appeal. When Superlume produced a greater depth of color *without* polishing than previous baths gave *with*, Ames got a tremendous bonus: *A reduction in its over-all finishing costs of 10 to 12%.*

"I never saw a bath that levels better," says Ray Schlotterbeck, "nor one that throws or brightens better, either." And Ames sales people add, "Our product quality was never higher."

Results like these are common with Superlume. Ask H-VW-M for full details.

H-VW-M

Progress in metalfinishing through advanced processes • equipment

Hanson-Van Winkle-Munning Company, Matawan, New Jersey
Offices in Principal Cities
Alert Supply Company is H-VW-M in the West
Los Angeles • San Francisco

The BIGGEST Time and Money Savers in Plating Rack History!

Racks for any job when you need them.
No delay—no waiting.

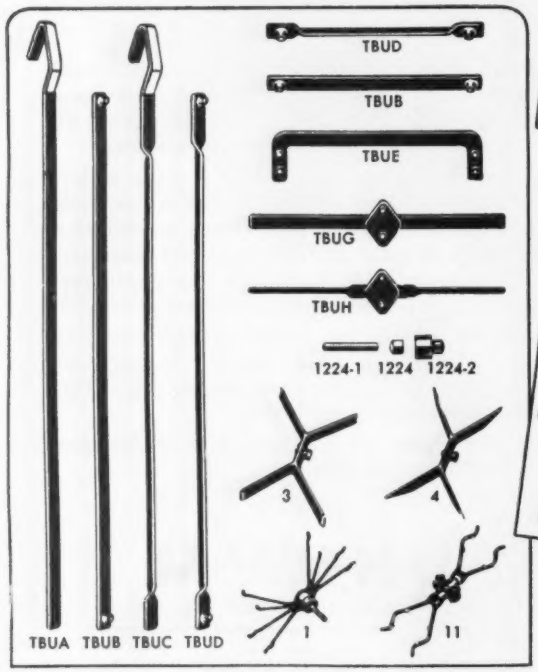
Quick and easy conversion.
Racks easily changed to fit different jobs—you can have top efficiency on every job.

Replaceable Tips for easy tip upkeep.
Enable you to keep every rack at full capacity.

Tremendous saving in plating rack costs.
You can make new racks designed for the job from members of discarded Thinker Boy Racks at the mere cost of assembly.

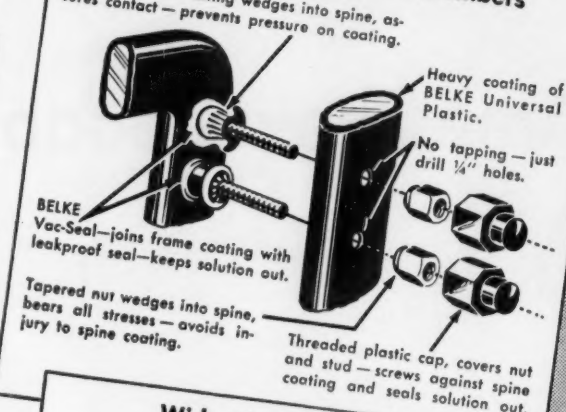
No added investment necessary. *Here's how you can cash in on the tremendous time and money saving economy of Thinker Boy Racks without investing an extra dime.*

1. When you need racks get *Thinker Boys.* Vac-Seal replaceable tips enable you to keep every Thinker Boy Rack at full capacity.
2. When Thinker Boy Racks of one design are no longer needed, convert them to a design you need or disassemble and store the parts.
3. When you need racks for a different job, assemble them from your stock of used Thinker Boy Parts. You get racks designed for the job in a matter of minutes for the mere cost of assembly.

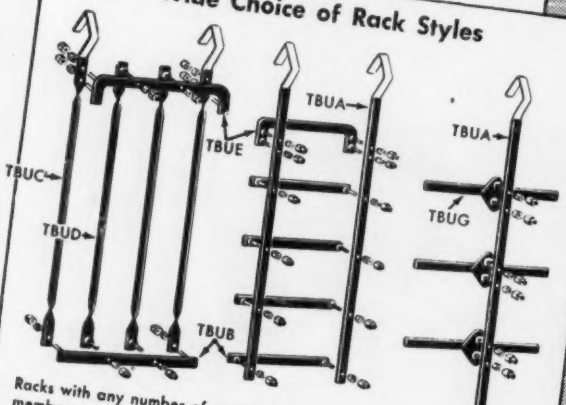


Thinker Boy Precoated Vac-Seal Parts are mass produced for low cost and carried in stock for prompt shipment. Furnished in any assortment or assembled to your specification. Ask your BELKE Service Engineer or write for descriptive bulletin and parts list.

LEAKPROOF ASSEMBLY of Thinker Boy Precoated Plating Rack Members

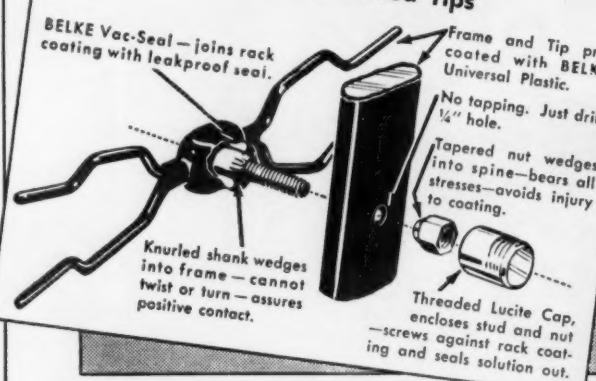

Tapered knurled fitting wedges into spine, assures contact — prevents pressure on coating.
Heavy coating of BELKE Universal Plastic.
No tapping — just drill ¼" holes.
BELKE Vac-Seal—joins frame coating with leakproof seal—keeps solution out.
Tapered nut wedges into spine, bears all stresses — avoids injury to spine coating.
Threaded plastic cap, covers nut and stud — screws against spine coating and seals solution out.

Wide Choice of Rack Styles



Racks with any number of vertical members, horizontal members or T members are quickly assembled from a small selection of Thinker Boy precoated Vac-Seal Parts—¼" drill and pliers are only tools needed.

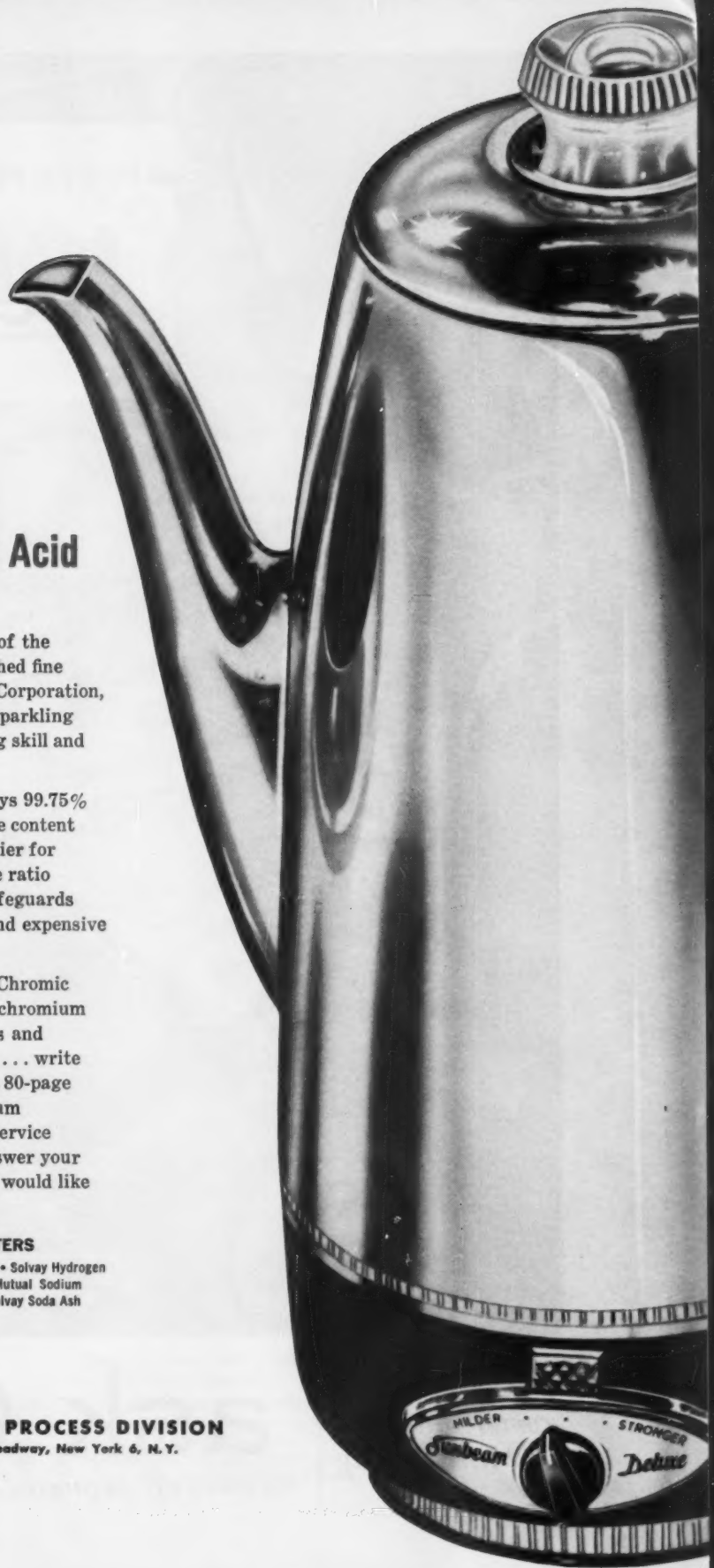
LEAKPROOF MOUNTING of Vac-Seal Precoated Tips


BELKE Vac-Seal — joins rack coating with leakproof seal.
Frame and Tip precoated with BELKE Universal Plastic.
No tapping. Just drill ¼" hole.
Tapered nut wedges into spine—bears all stresses—avoids injury to coating.
Knurled shank wedges into frame — cannot twist or turn — assures positive contact.
Threaded Lucite Cap, encloses stud and nut —screws against rack coating and seals solution out.

Belke MANUFACTURING CO.
947 N. Cicero Ave.
Chicago 51, Ill.
EVERYTHING FOR PLATING PLANTS

Sunbeam

brightens any table with Mutual Chromic Acid



This Coffeemaster is typical of the handsomely and durably finished fine appliances made by Sunbeam Corporation, Chicago, Ill. They owe their sparkling good-looks to Sunbeam plating skill and Mutual® Chromic Acid.

Mutual Chromic Acid is always 99.75% pure—or better. Its low sulfate content (less than 0.1%) makes it easier for you to control the acid-sulfate ratio of your plating bath. This safeguards against plating difficulties—and expensive rejects!

To learn more about Mutual Chromic Acid and the Mutual line of chromium chemicals . . . uses, properties and comprehensive technical data . . . write for your free copy of Solvay's 80-page Technical Bulletin, "Chromium Chemicals." Our Technical Service Staff will also be happy to answer your questions. State whether you would like to have a representative call.

SOLVAY® PRODUCTS FOR PLATERS

Mutual Chromic Acid • Solvay Caustic Soda • Solvay Hydrogen Peroxide • Solvay Methylene Chloride • Mutual Sodium Chromate • Mutual Sodium Bichromate • Solvay Soda Ash

Allied Chemical

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metal-matched

For the complete answer to better plating

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 FIELD SERVICE MEN • OVER 160 MATERIALS

complete line of materials for

ELECTROCLEANING

. . . improves the cleaning

. . . improves the plated-work

There are Oakite electrocleaners to meet the special requirements of all the usual basis metals being plated, and the soils generally left on the parts during fabrication operations.

Matched to the work, each electrocleaner does the job with remarkable efficiency and surprising economy. Service results show it. Users find that solutions have long life. Operating problems are at a minimum. Most importantly, a metal-matched electrocleaner assures a brighter and perfectly adhering plated finish.

TWO-IN-ONE CLEANING OF STEEL

Oakite 190 does double duty. A *chelated* detergent for anodic or periodic reverse current use, it removes smut, heat scale and rust bloom that normally need extra treatment. At the same time, its powerful alkaline detergency gets rid of oil films and shop soil. Such cleaning insures fewer plating rejects, and can in many cases eliminate an entire operating step.

CLEANING OF COPPER WITHOUT TARNISH

Oakite 191 gives fast, thorough electrocleaning action on brass and other copper alloys, while protecting against tarnish . . . especially in reverse current cleaning. Shop soils, smuts, light buffing compounds disappear quickly. For heavily soiled parts, the solution also serves as a non-tarnishing pre-soak.

FEWER REJECTS FOR ZINC DIE CASTINGS

Oakite 195 electrocleans without etching or discoloring buffed zinc base die castings . . . also works well with lead, brittania metal, steel and brass. Used with direct, reverse or periodic reverse current, it removes soils safely yet thoroughly . . . assuring a brighter chromium luster. Many users of this new cleaner have reported no rejects due to poor electrocleaning for the first time in their experience.

Ask Oakite to detail what's in store for you when you match these materials to your work. Write Oakite Products, Inc., 40 Rector Street, New York 6, N. Y.

it PAYS to ask . . . **OAKITE**

over 50 *Est. 1909* SCIENCE *years' leadership in industrial cleaning*

Media-matched compounds offer better barrel finishing

A good match of compound to the job means clean and efficient media . . . faster cutting down, deburring . . . and proper lubrication for smooth burnishing. Oakite can match your needs with compounds for fine finishes, tight tolerances - for hard or soft water. Send for Bulletin F-9339.

Stop spotting, add sparkle with Oakite Rinsite®

After plating and barrel finishing, adding a little Rinsite to rinse water, helps cut water spotting and staining. It "thins" the rinse, makes it drain faster. It also leaves a thin, non-oily, invisible film that adds sparkle and indoor rust protection to plated parts. Send for Bulletin F-9822.

800

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FROM DIAGNOSIS TO DISPOSAL

INDUSTRIAL, through its research and development groups, now offers the most complete waste treatment service available in the world today. The 800 Series inorganic waste treatment program includes:

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- Pre-designed package plants
- Compact custom designed plants
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Systems for *liquid/solid separation*, *gravity* or *pressure separation*, by manual, remote or full automatic control or programming, are available for handling these solutions:

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Write Dept. 800 for further details.

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Pressure Filters • Ion Exchangers • Corrosion Test Cabinets
Pumps • Water & Waste-Treating Equipment

C-360

Cycleflex

FULLY AUTOMATIC
PLATER & ANODIZER

Conveyor Breakdowns Eliminated with new electro-mechanical control and safety device. Racks can't be pushed into sides of tank; load can't drop if power fails during work transfers.

Positive 6-Point Connections. Self-cleaning heavy duty contacts need little or no attention.

Rack Carriers Quickly Removed. A big time saver when servicing, or manually plating large pieces.

Fast Cycle Changes by shifting tank partitions and moving pick-up heads.

No Extra Headroom Required. All elevating mechanism operates below top of rack carrier.

Automatic Loading And Unloading of racks.

Delayed Set-Down to operate automatically with cycle. Furnished if required for conversion coatings and bright dips.

If More Than One Cycle is necessary, by-passing can be built in.

Hydraulic operation, standard.
Pneumatic operation, optional.

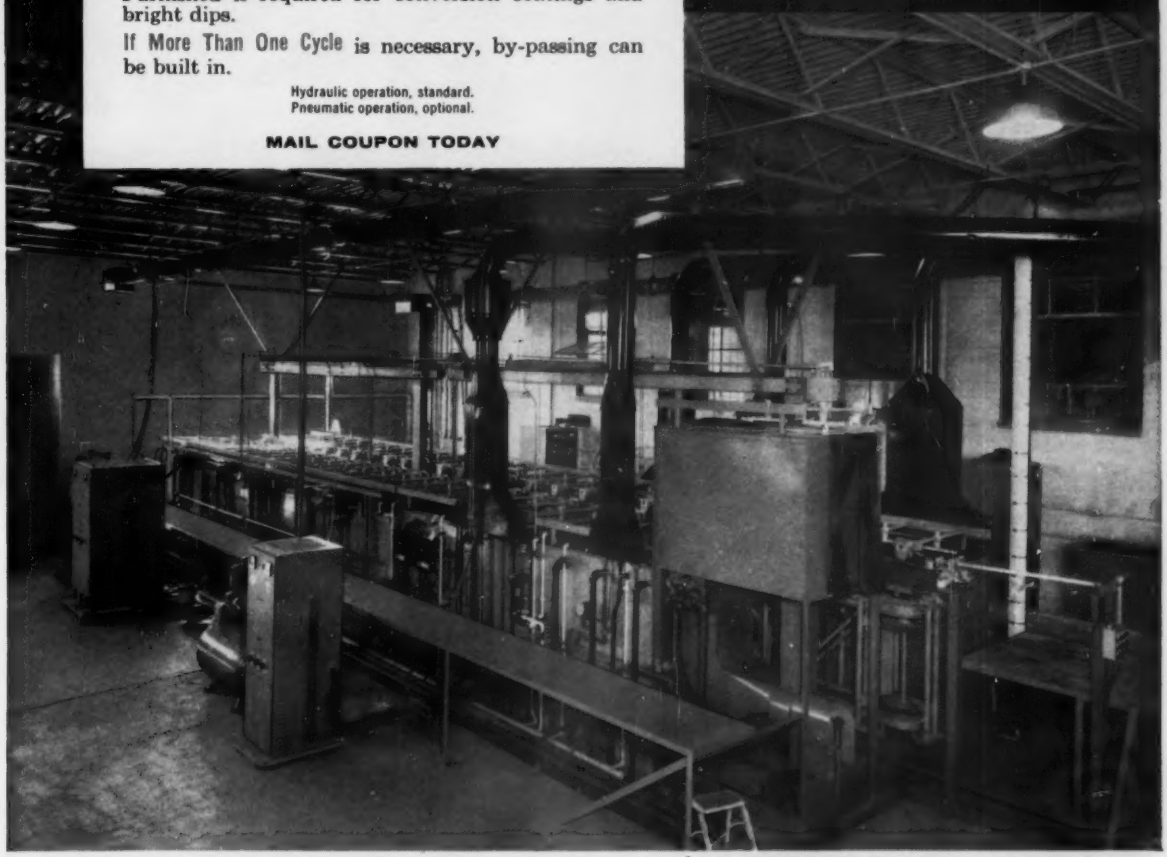
MAIL COUPON TODAY

ONE MAN

handles complete operation of this

MOST VERSATILE

OF ALL AUTOMATICS



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ATTACH TO COMPANY LETTERHEAD

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Name.....

Title.....

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VIC VAPOR RECOVERY SYSTEMS*

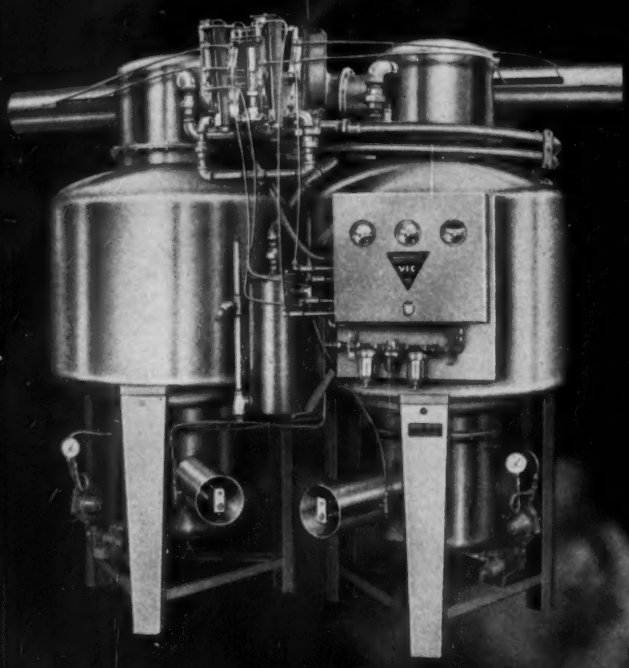
Now! For the first time—a completely new, compact, patented system for the recovery of usable solvent from vapors normally exhausted outside or lost to the atmosphere in working areas. Thoroughly field tested on actual installations, Vic packaged Vapor Adsorbers are easy to install—and most important—will pay for themselves on many installations in less than a year!

CUT SOLVENT COSTS IN HALF—by recovering more than ½ drum of solvent for every drum used!

ELIMINATE CORROSION AND FINISHING PROBLEMS—where vapors cause uneven or cloudy paint finishes, and corrosion on surfaces of manufactured or finished parts!

IMPROVE WORKING CONDITIONS—by preventing solvent vapors from entering working areas!

*Protected by one or more of the following patents: Pat. No. 2,480,320; 2,772,747; 2,760,594; 2,910,137. Canadian Pat. No. 470,085 and other Patents applied for in U.S. and Foreign Countries.



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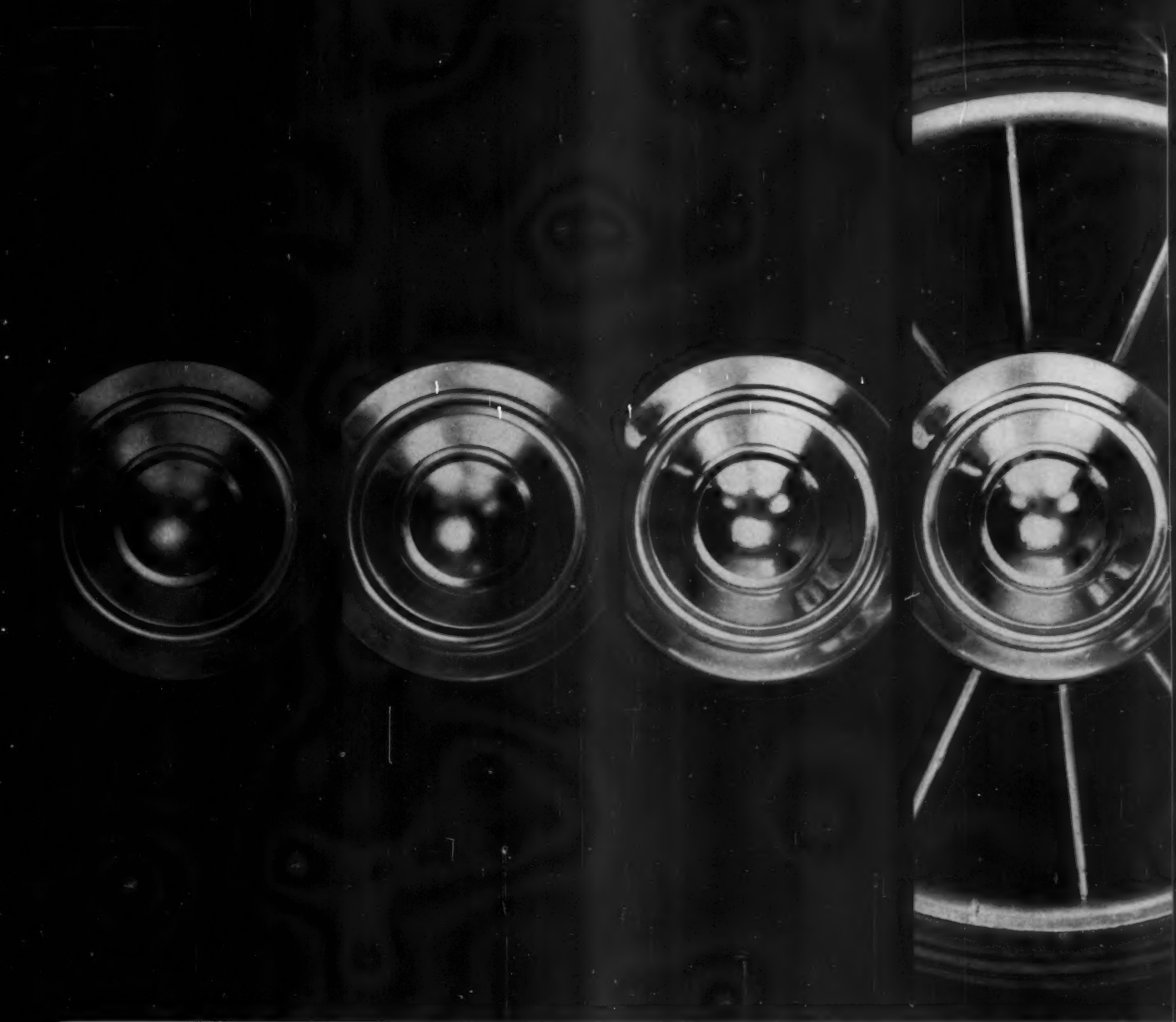

Make it a brighter lasting zinc finish

M&T offers you the complete zinc finishing "package": brightener, chromate dips, clear enamel.

Here's how to bring out all the brilliance that zinc can reflect when plated on a smooth-surfaced product. Two simple procedures do it. First, be sure to plate in a zinc bath to which you've added the new M&T ZINC BRIGHTENER 25. After plating, produce chromium-like appearance with a quick chromate treatment in UNICHROME CLEAR DIP.

A stable and concentrated liquid, the new brightener comes ready for immediate pouring. Its use assures coverage and a uniformly bright plate even in low current-density recesses. It works equally well in barrel, still or automatic plating...gives economical "mileage" with consistent results.

Unichrome Clear Dip adds remarkable durability to zinc plate at low material cost. It protects against "white rust," satisfies the corrosion-resistance specifications for chromate finishes. While the brightener brings out the brilliance you want, Unichrome Dip helps "permanize" it ...and primes it for a top coat of Unichrome Clear Enamel when you want a product finish of truly superior quality.

Send for more data on M&T's complete line of supplies and processes to improve the economy of zinc finishing operations and the quality of the finish.

M&T Plating Products

METAL & THERMIT CORPORATION GENERAL OFFICES: RAHWAY, NEW JERSEY IN CANADA: M&T PRODUCTS OF CANADA LTD., REXDALE, ONT.

"By plating this part with LEVELUME 220 we slashed polishing time in half"

says JOSEPH T. HINES, Plant Manager, Southern Finishers, Inc., Nashville, Tenn.

A 50% reduction in the time it takes to polish this griddle cover is only *one* of the reasons Southern Finishers, Inc., is so enthusiastic about Levelume 220. This plater of some 500 different parts has cut polishing time one-quarter in *over-all* operations. Copper plating and copper buffing have been done away with on the griddle part and many others—saving up to two steps in seven.

"Appearance is better, too," says Joe Hines, a plater for 16 years. "Levelume 220 hides scratches nicely, plates brighter in recessed areas than any bath I've ever seen."

Southern is plating parts from ½-inch faucet buttons to 64″ x 25″ wire racks. What will Levelume 220 do on what *you're* plating? Ask H-VW-M.

H-VW-M *Progress in metalfinishing through advanced processes • equipment*

Hanson-Van Winkle-Munning Company, Matawan, New Jersey • Offices in Principal Cities
Alert Supply Company is H-VW-M in the West • Los Angeles • San Francisco

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SUBMERGED FILTER SYSTEM

for universal application

MODEL SUBLL-S

$195.00

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ECONOMY IN OPERATION

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[illegible]	[illegible]	[illegible]	[illegible]
SUBLL-S	200 GPH	400 GPH	$195.00
[illegible]	[illegible]	[illegible]	[illegible]

"tagged" as the finest *at lowest cost...*

by platers, chemists and engineers

- full-view filtration in depth
- no loss of expensive solutions
- leakproof, agitates without aerating, self-priming
- maximum flow rate up to 4x our own work rate capacity
- fits anywhere on tank, saves floor space (3½" diam., 3" immersion depth), minimum displacement in tank
- abundant flow and pressure for longer tube life
- filters from all levels, not just the surface; skimmer available to keep surface free of dirt
- completely corrosion resistant
- trouble-free operation; one-year guarantee

UNIVERSAL APPLICATIONS

For filtering every solution:
from lead to gold
from pH 0 to pH 14
from 70° F. to 200° F.

Only SETHCO gives you optional custom equipment at standard cost!

HIGH TEMPERATURE APPLICATIONS: Electroless nickel, etc.
HIGH CHLORIDE APPLICATIONS: Woods' Nickel, Iron, etc.
CHROMIC ACID APPLICATIONS: Oxidizing baths, etches, etc.
ALL METAL CONTACT ELIMINATION: Acid gold, rhodium, etc.
SKIMMER: Removes surface dirt.

SETHCO — recognized throughout the filtering industry for "first with the finest"—now offers a completely new concept in a universal, submerged system. This new SUB series, thoroughly tested in lab and field, has already more than proved its reliability and unmatched economy. No valves to leak, no tank drains to fuss with, no chance for costly fluid loss. The nearest thing to automation in filtering!

Write or Call Now for Bulletin No. 551

Sethco

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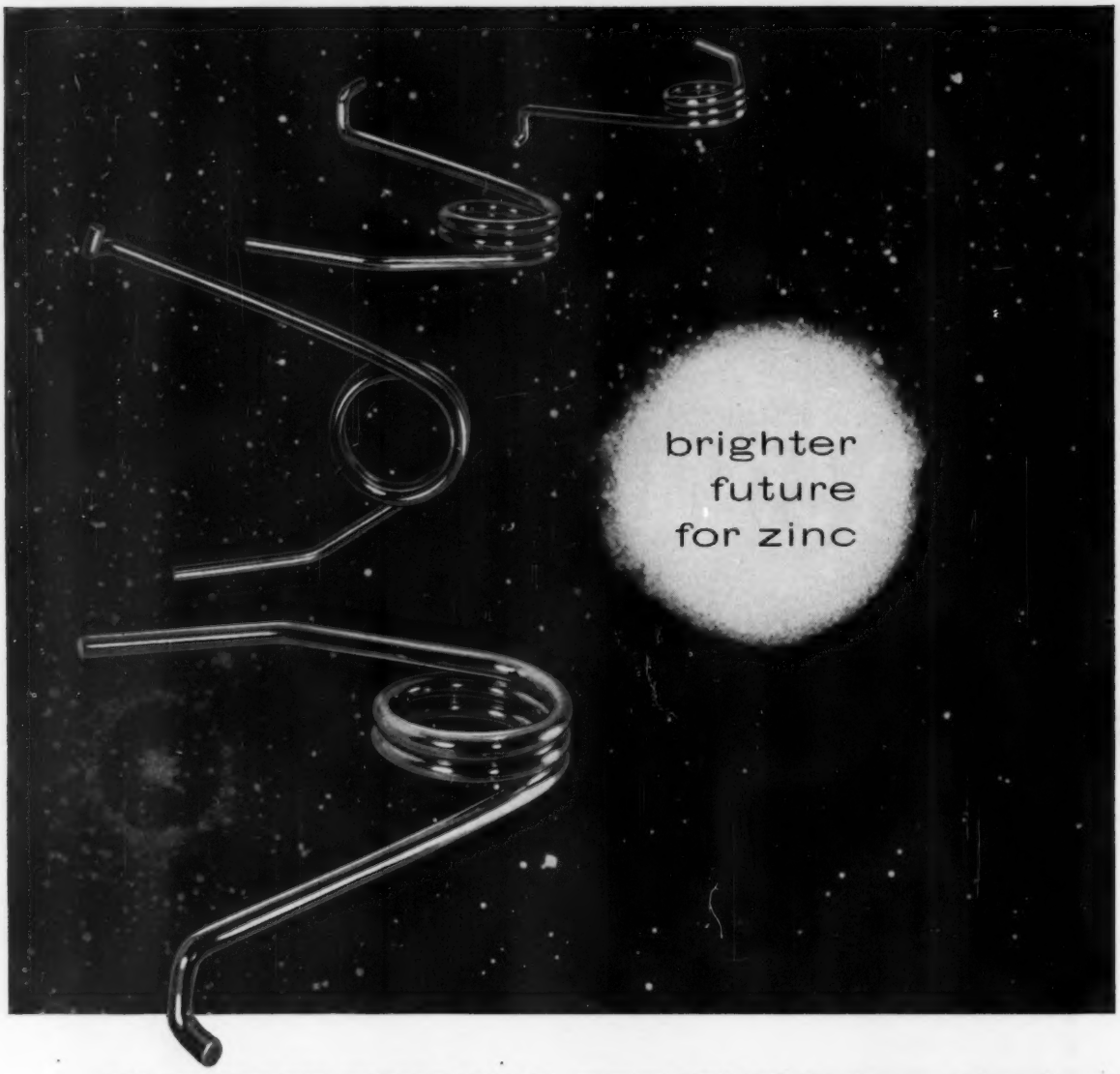
DEPTH FILTRATION FOR ALL ELECTROPLATING AND INDUSTRIAL APPLICATIONS • METAL FINISHING • PHOTO PROCESSING • PETROLEUM • SOLVENTS • LACQUERS • PHARMACEUTICALS • ULTRASONIC CLEANERS • RADIOACTIVE SOLUTIONS • WATER • ELECTROTYPING



...with FINEST FINISHING PROCESSES from Cowles

Looking for better zinc plating results? . . . Cowles has a complete line of zinc brighteners that provide all degrees of lustre from high brilliance to soft satin to give a new look to your products, speed up processing and produce more uniform results.

Cowles' complete plating services go far beyond zinc brighteners. You can depend on Cowles products and processes for every phase of cleaning, phosphating, conversion coating, coloring and final protection. Your Cowles Technical Man can demonstrate immediate improvement in your own operation with Cowles Finest Finishing Processes. Take advantage of it — call Cowles today!

Ask your Cowles Technical Man about these brighteners . . .

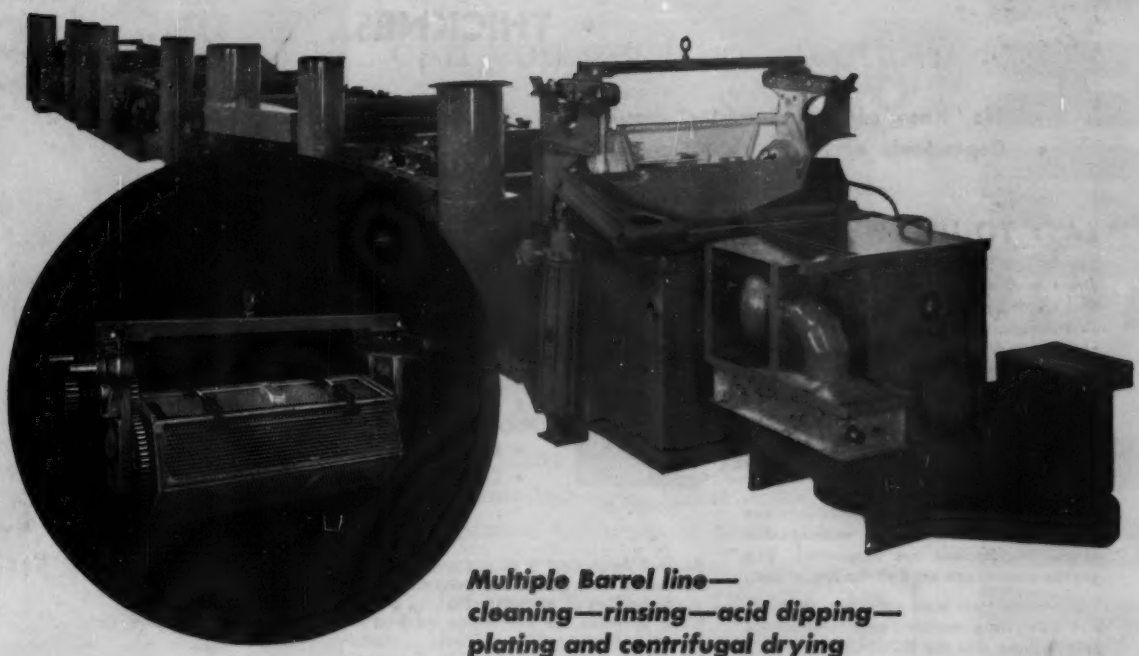
for low current density cyanide zinc electroplating:
PROMAT B4
PROMAT B4M
PROMAT B105
PROMAT ZB2

for high current density cyanide zinc electroplating:
PROMAT C42

for acid zinc baths:
PROMAT AZ 6550
PROMAT AZ 6556
PROMAT AZ 6570
PROMAT AZ 6575

Cowles **CHEMICAL COMPANY**
7016 Euclid Ave. • Cleveland 3, Ohio

CROWN PLATING BARRELS



Multiple Barrel line—
cleaning—rinsing—acid dipping—
plating and centrifugal drying

CROWN LUCITE CYLINDERS

Can be operated through the entire cycle cleaning—rinsing—acid dipping—and plating solutions.

Whether your production requires a single barrel or a multiple set up for cleaning, rinsing, acid dipping, and plating, there are Crown barrels to fit the job.

Write for complete details

CROWN RHEOSTAT AND SUPPLY COMPANY
1965 PRATT BOULEVARD • ELK GROVE VILLAGE, ILLINOIS

Use KOCOUR TEST EQUIPMENT

FOR • ANALYSIS
• pH CONTROL
• THICKNESS TESTING

• No "Knowledge of chemistry" required • Streamlined methods • Direct readings •
• Dependable accuracy • Simplified calculations • Complete and ready to use •

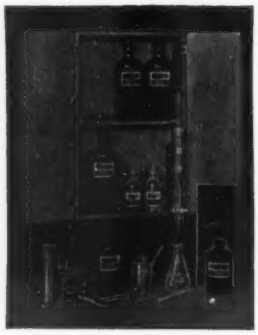
EASY TO USE!

Kocour Test Sets provide you with the most direct methods of analysis, simplified so that anyone can make tests with dependable accuracy. The step by step directions are easy to follow. Examples of how to calculate additions are also included.

KOCOUR TEST SETS are complete and ready to use. You get all of the necessary reagents and glassware, contained in a wall type wooden cabinet for convenient use and storage.

Certain test sets can be combined into one economical test set, to suit your specific needs. Duplications are eliminated. You get the control you need at the lowest cost.

Don't waste your time preparing reagents . . . using long methods and complicated calculations. Get the KOCOUR TEST SET you need.



FOR EVERY PURPOSE!

KOCOUR Test Sets and Instruments are available for anodizing and surface treatment baths, plating solutions, cleaners, pickles, plating waste effluents, metal identification, pH papers, pH comparators, pH meters, Hull Cells and accessories, lab rectifiers, and Thickness Testing instruments.

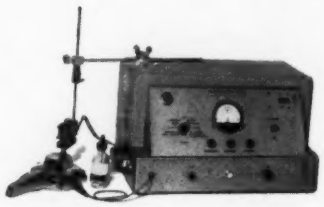
MODEL CA

ANALYTICAL SETS FOR CHROMIUM

- Chromic Acid
- Sulfates
- Trivalent chromium
- Iron impurity
- CPA-1800

Several Analytical Sets are available for chromium . . . Model CA determines the concentration of chromic acid . . . Model KSTS provides the centrifuge method of determining the sulfate content . . . Model CR Comparator determines % Trivalent Chromium . . . Model FEC determines the iron impurity . . . Model CPA determines the proprietary additive CPA-1800. In each case the quickest method provides the result with dependable accuracy.

Model KSTS for sulfates in chromium



Model 955 provides Everything you need in a Plating Thickness Tester!

1. WIDE APPLICATION

Determines the thickness of most common deposits on various basis metals.

2. WIDE THICKNESS RANGE

Minimum thickness for Model 955 is 2-3 hundred-thousandths of an inch (2-3 millionths for decorative chromium). For testing thin deposits, Accessory Model MT provides direct readings in millionths of an inch.

3. VERSATILITY

Test plane, or curved surfaces down to ¼" diameter . . . composite coatings with individual readings of actual thickness. Accessory WT is used for deposits on a wide range of wire gauges.

4. ACCURACY

Accuracy 90-95%. Human error virtually eliminated. "Calibration" feature monitors both accuracy and performance.

5. SIMPLE OPERATION

Just set up the specimen . . . set the selector switch . . . and press the button. Average test requires about one minute . . . readings are direct.

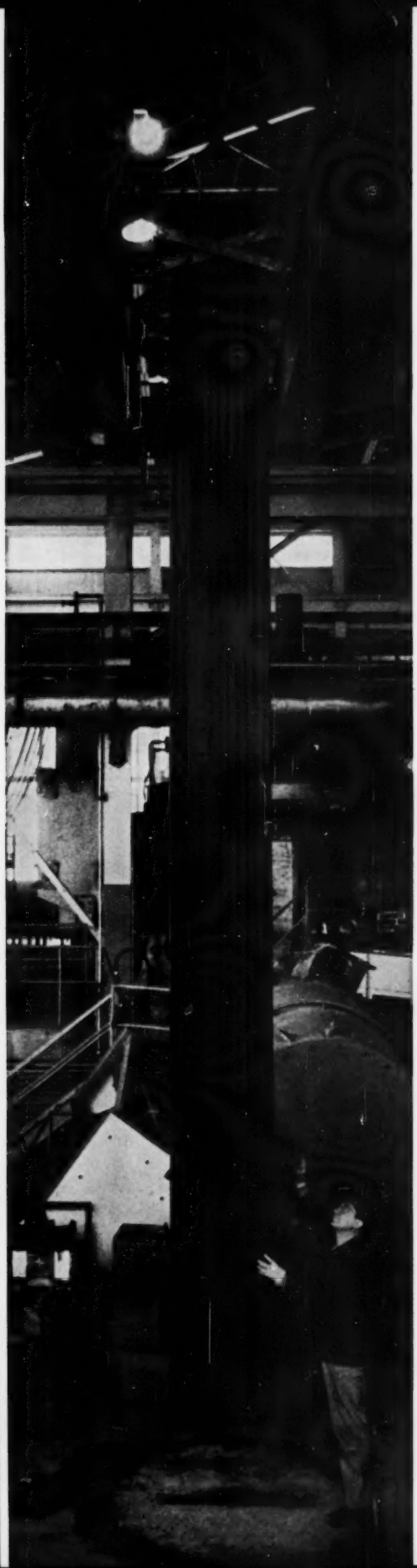
6. GUARANTEED SATISFACTION

First, let us evaluate your application . . . no cost, no obligation. Try Model 955 in your own plant for 15 days. See for yourself . . . what it does . . . how it suits your needs.

Write for Bulletin 461

Let us know your problems specifically, we will send our recommendations at no cost . . . no obligation. Ask for your free copy of "Lab Hints for the Plater".

KOCOUR COMPANY
4802 S. ST. LOUIS AVE.
CHICAGO 32, ILL.

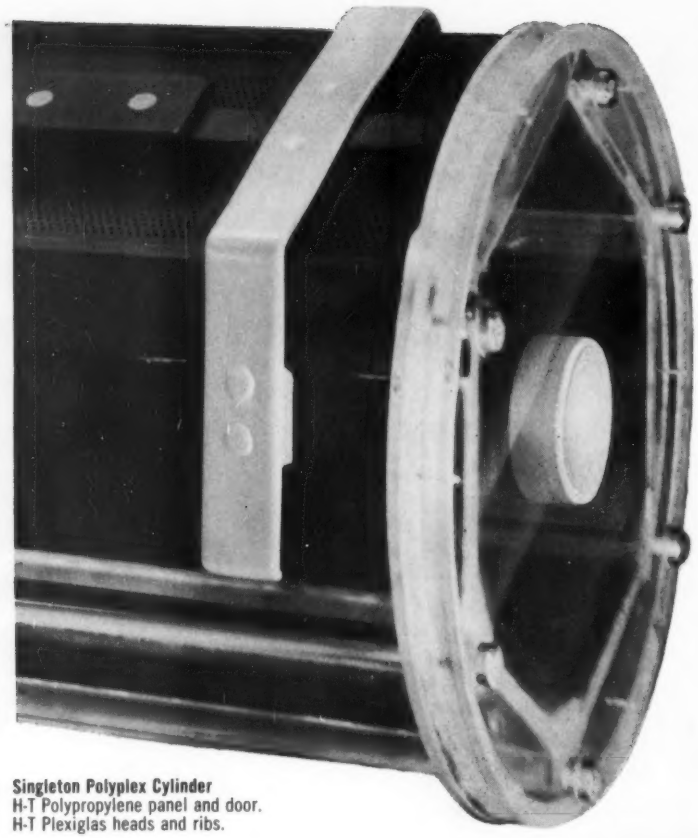


ASARCO-MAX ANODES

How close can you get to perfection in copper anodes?

Here you see the closest thing to perfect copper now available for electroplating purposes. This is the huge, void-free, dense cake of copper from which Asarco-Max copper anodes are cut. The patented Asarco process gives a grain structure so uniform that an inspection of Asarco-Max anodes in the plating tank, one by one, makes you think you are looking at the same anode each time you pull one out. Corrosion of the anode is uniform from the solution level down to the end, and this reduces scrap loss and down-time for anode replacement. Asarco-Max copper anodes will be cut to provide the length and weight you prefer. For additional information about our low-cost anodes, write or call Federated Electro-Chemicals Department, American Smelting and Refining Company, 120 Broadway, New York 5, N. Y.

ASARCO



Singleton Polyplex Cylinder
H-T Polypropylene panel and door.
H-T Plexiglas heads and ribs.

they can't beat the Champ!

It's "no contest." The best plating cylinders other "makes" can produce are no match for a **Singleton.** Platers have proved this for themselves. In the most critical and punishing thru-cycle barrel plating, Singleton Replacement Cylinders out-perform them all **consistently . . . at lower cost.** Here's why:

Greater Strength — Singleton's exclusive "All-Bolted" heavy, "Trussed-Rib" construction. Built like a bridge. Bigger pay loads (to 350 lbs.). Longer, heavier-duty service.

Chem-Temp-Resistance — Singleton's exclusive component combinations of modern hi-performance synthetic materials for all solutions, acid or alkalie. Temperatures to 220°F.

Plating Efficiency — Singleton's exclusive uniform panel hole pattern. More perforations per inch—better circulation. Bussed for 1420 amps. Faster, higher quality plating at lower cost.

Less Maintenance—Singleton's exclusive 100% interlocking replaceable parts. Interchangeable in any combination. Do-it-yourself with only a ½" wrench and pliers. Less "outside" delays. Less down-time.

Singleton Replacement Cylinders Fit Your Existing Installations — Any Make, Type, Size, Age!

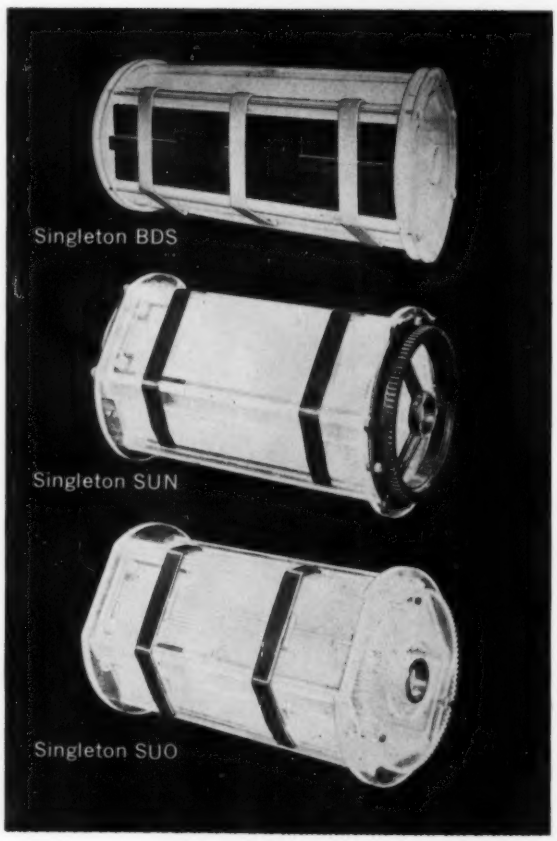
Here's the easiest, lowest-cost way to optimize your barrel plating, boost productivity and earnings. Increase your output 20% and more; get easily 50% longer, trouble-free service (platers' reports on request). Convert to Singleton Replacement Cylinders and bring your barrel lines up to an immediate all-time peak in operating efficiency. Make it a "grand slam" changeover for best results, or a cylinder-at-a-time; you name it. Choose from All-Bolted or All-Welded models in H-T Plexiglas, H-T Polypropylene, H-T Tempron, H-T Seilon; or combination units — Templex, Polyplex, Seiplex, Polytemp, and others. The **right** combinations of hi-performance synthetic materials in heads, ribs, panels and doors will work wonders for your individual processing requirements. Get all the facts on: **Singleton Replacement Cylinders** to fit all makes, types, sizes, ages of superstructures. **Singleton Cylinder-Superstructure Units** to fit existing installations — any make, type, size, age. **Singleton "Cogged-V-Belt" Drive (or gear) Plating Barrels,** single or multi-station, allied equipment and accessories. These and others are featured in the new Singleton General Bulletin. Includes data, prices, etc. Send for it.

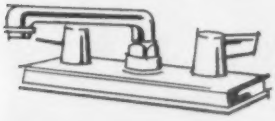
All features of this equipment are covered by Singleton's U. S. Pat. 2,886,505.

Ask about new, money-saving "special deal".

Singleton

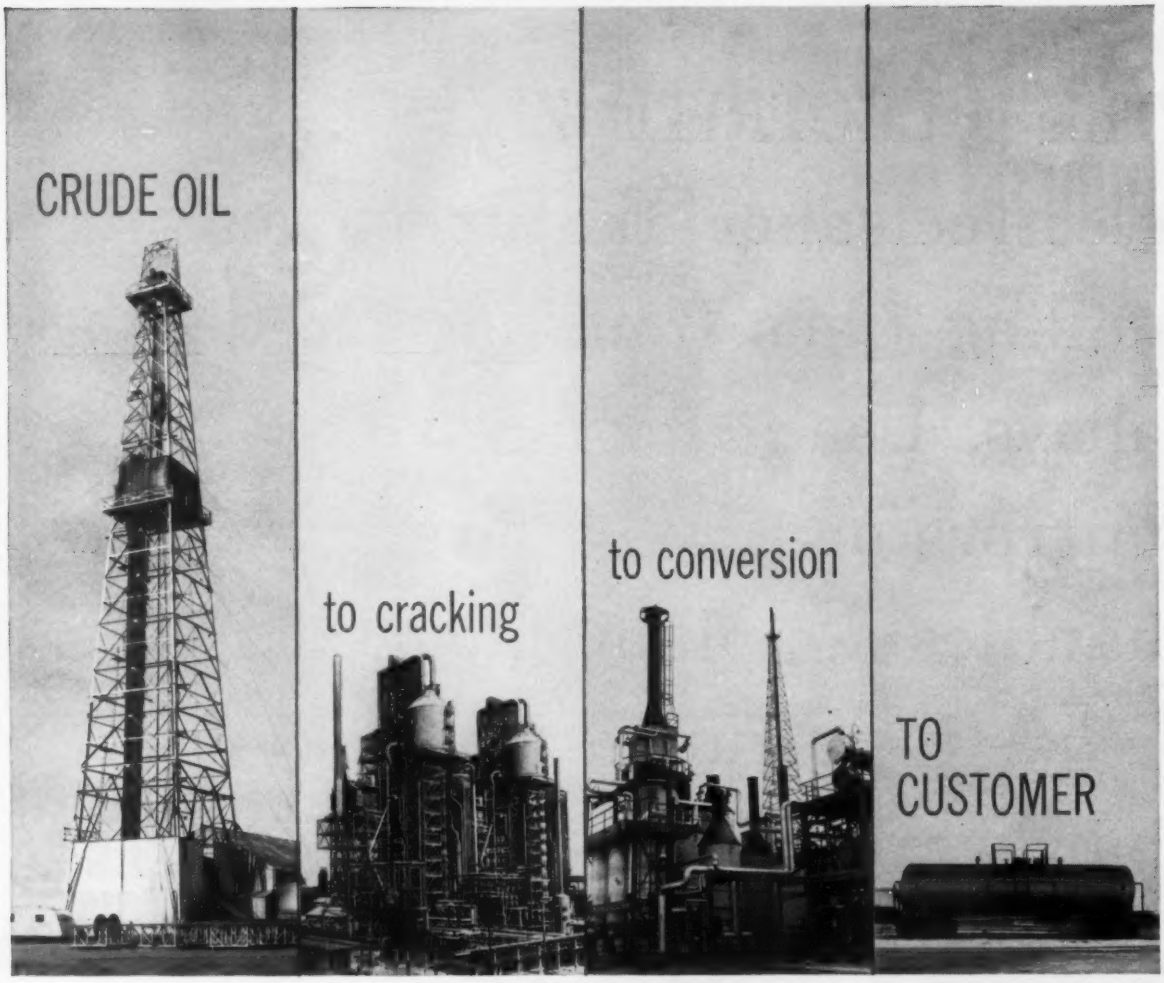
Please contact **The Singleton Co.**, 11720 Berea Rd., Cleveland 11, Ohio.
Telephone: CLearwater 1-5580.



This is LECTRITE 'Z' ...the new electrocleaner that removes all dulling films from all zinc die-cast alloys. Use it for side-view mirrors or refrigerator handles . . . plumbing fixtures  or furniture hardware. You'll get streak-free, shadow-free plating every time!

And...LECTRITE® 'Z' is adaptable to hand lines and automatics—will even handle die castings and brass parts in the same line. It is built with heavy-duty, anhydrous ingredients for long and trouble-free service. It provides a light foam blanket that is right for all electrocleaning operations—eliminates explosion possibilities, yet retains fumes. It is non-dusty and easy to handle.

If you can use advantages like these, put LECTRITE 'Z' to work. Get in touch with your Wyandotte representative, today. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, California, and Atlanta, Georgia. Offices in principal cities.*



Enjay ACETONE offers controlled high quality...

At Enjay, careful, step-by-step control of quality starts when the crude leaves the ground and does not end until the finished chemical is delivered to your plant. Enjay Acetone comes to you *only* after it has passed strict specification tests using modern test methods, including gas chromatography. You'll find our specs among the highest in the industry:

Purity (wt per cent) min.	99.5
Specific Gravity (20/20°C) min.	0.791
Specific Gravity (20/20°C) max.	0.793
Acidity, (as acetic acid—wt per cent) max.	0.002
Color (Pt-Co) max.	5
Water (wt per cent) max.	0.5
Non-volatile Matter (mg/100 ml) max.	1
Distillation (°C)	
Initial min	55.5
Dry Point max.	56.5
Permanganate Test (hrs) min.	2
Appearance...Clear and Free of Suspended Matter	

Users of Enjay Acetone are assured of dependable supply from modern facilities; rapid delivery from strategically located supply points; and technical service that is unsurpassed in the industry. Let us show you how these assets can make a difference to you. Write Enjay, 15 W. 51st St., N.Y. 19, N.Y.

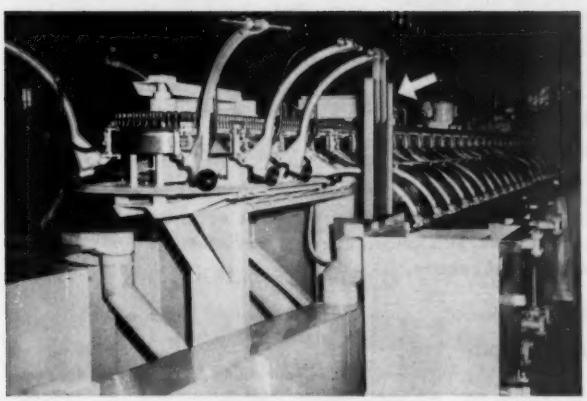
EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY CHEMICAL COMPANY

A DIVISION OF HUMBLE OIL & REFINING COMPANY

ENJAY CHEMICALS

VERTICAL LIFT!



Rack size and distance of lift shown by metal plate.

- Offers all the economies of automatic plating on limited and medium-volume operations.
- Permits use of narrower-width tanks for rack plating, thereby reducing space requirements.
- Features smooth, dependable operation and proven design simplicity for which Stevens equipment has long been famous.
- Provides complete application flexibility for electroplating, anodizing, phosphating and other dipping and coating processes.

"Little Steve" in the new, vertical lift model, with the traveling hump cam action, will become an important member of your production plating team. Investigate Stevens' low-cost, automatic plating equipment today!

Remember—when you go *automatic* ... go STEVENS!

frederic b. **STEVENS,** inc.

DETROIT 16, MICH.

BUFFALO CHICAGO DETROIT CLEVELAND
DAYTON NEW HAVEN INDIANAPOLIS SPRINGFIELD (OHIO)

LOOK FOR THE DIAMONDS—SIGN OF FINISHING QUALITY

NOW—3 ISOBRITE® COPPER PLATING PROCESSES

to fit your operations, your production and cost needs.

ISOBRITE® COPPER #607-622 FULL BRIGHT

Best for high-speed, full-bright finish on zinc die castings, steel, brass or bronze.

CONSISTENT MAXIMUM BRILLIANCE—Primary agent suppresses burning, secondary agent operates well in medium and low current density area; both contribute to overall brightness.

COMPLETE COVERAGE—Covers extremely well in low current density areas. Ideal for parts requiring deep throw; produces plate in deep recesses comparable to buffed areas.

ECONOMY—Plates uniformly over high and low current density areas to save on copper consumption. Easy analysis for brightener level.

ISOBRITE® COPPER #623 GENERAL PURPOSE

Ideal for shops with varied operations. Gives full or semi-bright plate on zinc base die castings, steel, brass or bronze.

EASY-TO-USE—A single addition agent for rack or barrel plating. Easily controlled for desired brightness level.

HIGHLY ECONOMICAL—Use as semi-bright at half the cost of full bright solutions.

VERSATILE—Easily buffed to cover wheel marks. Also brightens well in areas not easily accessible to buffing. Use in rack or barrel plating operations.

ISOBRITE® COPPER #625 BUFF BRIGHT

Produces a very soft plate for quick buffing.

A COMPLETELY ORGANIC SYSTEM—No metallic constituents.

VERY ECONOMICAL—Works well over wide variations of temperatures and concentrations.

EXCELLENT FOR STOP-OFF—Produces plate that resists penetration by heat-treating or case hardening.

VERSATILE—Use in cyanide solutions with or without tartrates, Rochelle salts or proprietary substitutes.

These Isobrite Copper Processes contain no lead and are ready to work as soon as current is turned on, even after week-end shut downs. This means increased production and substantial savings by eliminating poorly plated rejects.

Auxiliary Addition Agents for Added Efficiency and Economy

ISOBRITE #630 Aids anode corrosion for greater efficiency and produces finer grained deposits.

ISOBRITE #631 Chrome reducer. Wide range of operation. Forms no undesirable breakdown products.

ISOBRITE #627-W Wetting agent. Non-ionic surface agent with low-foaming action.

ISOBRITE #628-W High detergency type wetting agent for severe organic contamination. All our wetting agents are easily cleaned from parts to give good nickel adhesion.

See your Allied Field Engineer for complete information and recommendations for the specific process that best meets your requirements. He's listed under "Plating Supplies" in the yellow pages. Or, write for FREE TECHNICAL DATA FILES.

Allied Research Products, Inc. 4004-06 EAST MONUMENT STREET • BALTIMORE 5, MARYLAND
BRANCH PLANT: 400 MIDLAND AVENUE • DETROIT 3, MICHIGAN
West Coast Licensee for Process Chemicals: L. H. Butcher Co. • European Agent: Sture Gramberger, Stargaton 10, Stockholm, Sweden

Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment and Supplies for Metal Finishing

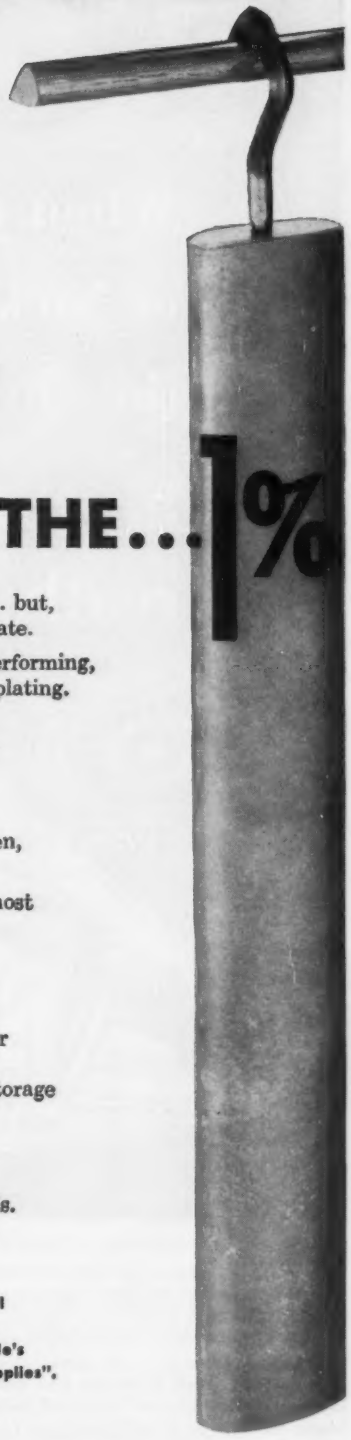
IRIDITE® Chromates | IRILAC® Coatings | ISOBRITE® Brighteners | ARP® Supplies | WAGNER Equipment

LOOK FOR THE DIAMONDS—SIGN OF FINISHING QUALITY

BUYING 99+% NICKEL?

Here's why you should

CHECK WHAT'S IN THE...1%



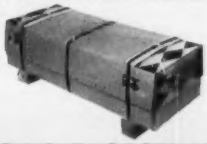
Of course, you, as a nickel user, want 99% pure nickel anodes . . . but, it's that 1% that makes the difference between good and bad plate.

At Allied Research, we make sure that 1% gives you a better performing, more economical anode, for fast, smooth, low-cost and efficient plating.

Here's how:

1. All our nickel anodes are cast from 100% electrolytic nickel—free from harmful contaminates.
2. Carbon and silicon are carefully added to assure you of even, constant corrosion rate and faster, smoother plating.
3. Copper and iron are kept to a minimum—well below the most rigid specifications—eliminating excessive brightener consumption, down time or rejects.

NEW ALLIED RESEARCH ANODE PAK



Sturdy, corrugated cartons keep your anodes clean, uncontaminated—ready to use. Paks make handling, storage and inventory easier, too.

NICKEL RECASTING SERVICE

Your nickel butts and spears recast under the same rigid controls. For really substantial savings, get details on our Nickel Recast Blanket Purchase Plan.

For full information on Allied Research Nickel Anodes, Anode Pak or our Nickel Recasting Service, contact your Allied Field Engineer. He's listed in the yellow pages under "Plating Supplies". Or, write for FREE TECHNICAL DATA FILES.

Allied Research Products, Inc. 4004-06 EAST MONUMENT STREET • BALTIMORE 5, MARYLAND
BRANCH PLANT: 400 MIDLAND AVENUE • DETROIT 3, MICHIGAN
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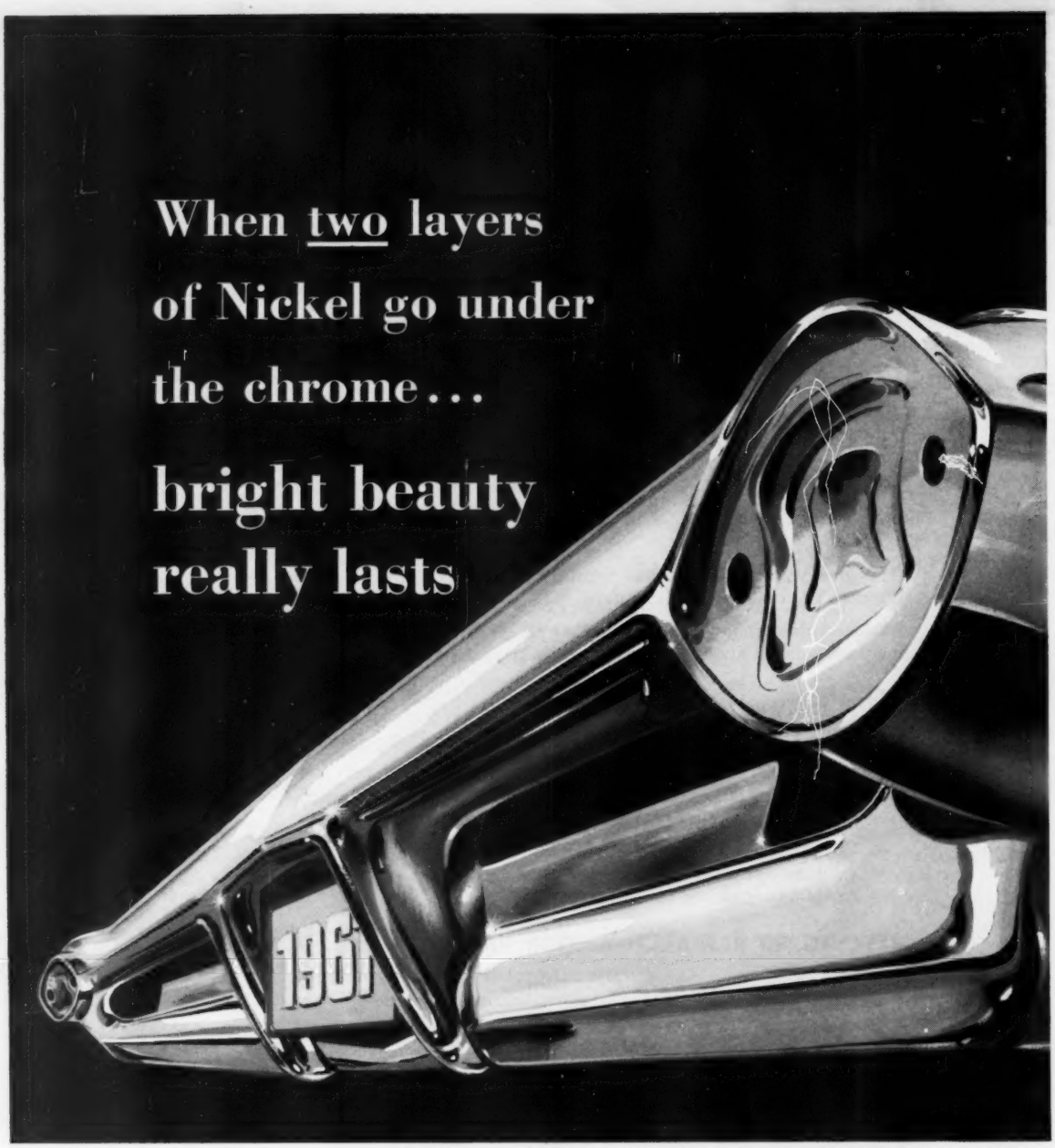
Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment and Supplies for Metal Finishing

IRIDITE® Chromates | IRILAC® Coatings | ISOBRITE® Brighteners | ARP® Supplies | WAGNER Equipment



That's right! Not one, but *two* layers of Nickel go under the thin chromium overlay. The first thick layer—of semi-bright Nickel—evens out surface imperfections, reduces . . . in many cases eliminates . . . high polishing and buffing costs. The second layer—of fully bright Nickel—adds brilliance and further increases protection against corrosion. No worry about harsh cleaning compounds harming the finish here!

Double-Layer Nickel Plating for lasting beauty. It's the double layer of Nickel that makes possible the lasting quality of the finish. This thick, durable combination provides outstanding resistance to corrosion, abrasion and wear. There's a world of sales appeal in the lustrous beauty of Double-Layer Nickel Plating, and a world of durability in its performance.

If your need is for a coating system for rugged performance, consider the advantages of Double-Layer Nickel Plating. We'll be glad to send you a copy of *Decorative Plated Coatings of Improved Durability*. Just drop a line to:

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street INCO **New York 5, N. Y.**

Inco Nickel

Nickel makes plating perform better longer

New burnishing compound

SAFEGUARDS steel media!

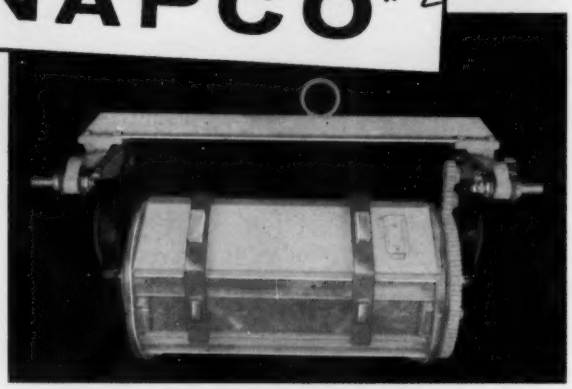
. . . yet produces a brilliance, a deeper lustre on brass, copper, nickel silver and silver surfaces. It's ideal for stainless steel and steel parts, too. You'll find that non-saponaceous, dust-free TV-4 leaves no dulling film and it eliminates the need for cleaning. Parts are all ready for lacquer or plating, and in less time, too. Burnishing time is cut and except in cases of severe tarnish, acid pickling prior to burnishing can be eliminated. Special ingredients in TV-4 permit lower concentrations and still remove oxide film while burnishing. Even if you leave the work in solution overnight, TV-4 will not tarnish it nor will it pit or rust your steel media.

You'll agree that TV-4 was planned with *your* problems in mind. Let us send you our Bulletin on this new compound . . . then let us show you what TV-4 can do right in your plant.

PLANNED SERVICE *for better metal finishing*

THE Hubbard Hall CHEMICAL COMPANY • Waterbury, Conn.

specify NAPCO*



NAPCO'S MITEY-MITE PLATER (only barrel of its kind)
Small loads are no longer a problem. Just load MITEY-MITE, place in your barrel and plate. Contact is made thru the work load, into a small dangler and into the MITEY-MITE. Every plater will find MITEY-MITE's quick load and unload features essential. Can be ordered in a set of 3 or a single unit —Sizes 6" - 4½" - 3".

NAPCO'S FULL CYCLE PLATING BARREL
. . . . With Plastisol covered hanger arms, 3/32" standard perforations, danglers, polypropolene ring gears and gear train, coated and uncoated superstructures. Barrel materials available in, Polypropolene, Lucite, Melamine, Bakelite. Complete stock sizes—14x30 - 14x32 - 14x36 - 15x30 - 15x36 - 16x30 - 16x36 - 18x36.

NAPCO maintains a department with complete replacement parts for ALL manufactured barrels. All items complete manufactured in our plant. (Dealers inquiries invited)

*NATIONAL PLASTICS & PLATING SUPPLY CO.

Box 34 Bristol LUdlow 3-1326 Terryville, Connecticut ● "Over 27 years experience in Plastics"

Rhodium

ELECTROPLATING SOLUTIONS

Backed by

60 Years of Specialization

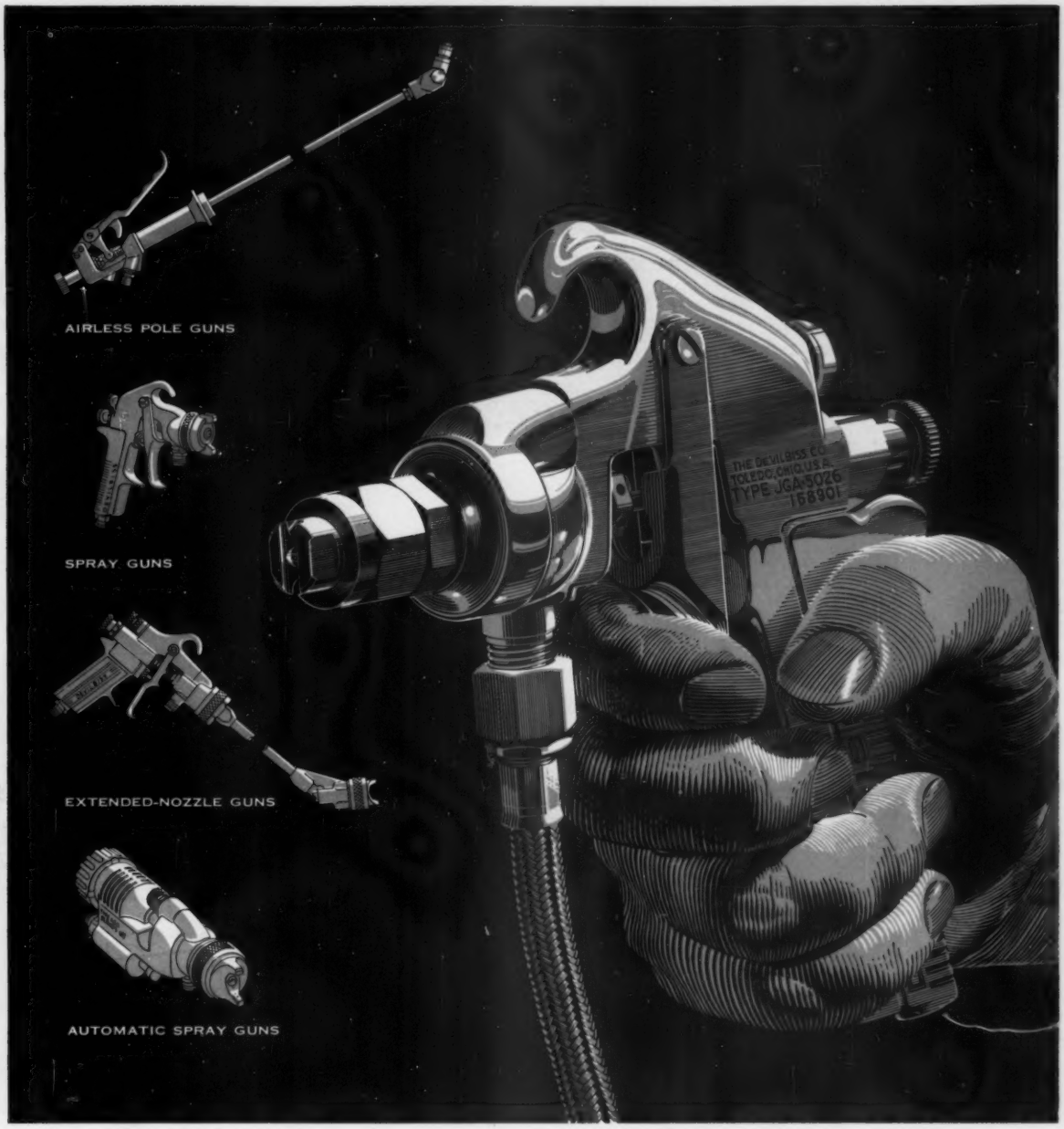
Rhodium electroplate is suggested for these applications: on wave guides and microwave equipment which may be used in marine atmosphere; in printed circuits; in electrical contacts where light contact pressure and low voltages are involved...Rhodium is very hard and corrosion-resistant.

This Rhodium plating solution is easy to use. It operates over a wide range of temperatures and current densities. We will be glad to plate samples without charge.

Consult our staff about plating problems.

SINCE 1901

SIGMUND COHN MFG. CO., INC. — 121 SOUTH COLUMBUS AVE. MOUNT VERNON, N.Y.



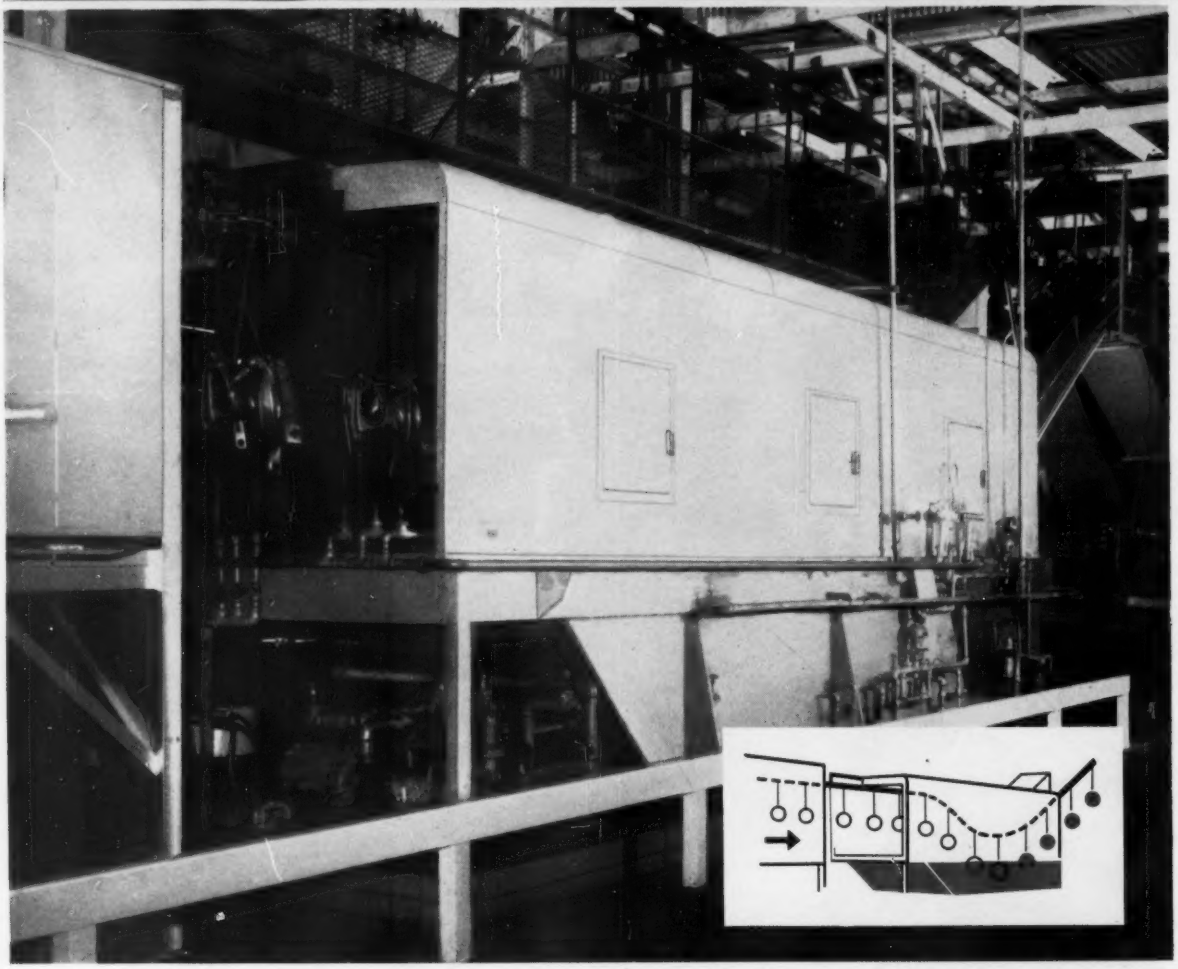
spray guns from DeVilbiss apply almost anything that pours—far faster than any contact-application methods. They're part of DeVilbiss' complete line of matched equipment for coating and finishing, that includes: dip and flow coaters, air compressors, air and fluid hose, spray booths, industrial ovens, spray washers, air-replacement units, dust collectors, "turn-key" finishing systems.

Talk to DeVilbiss about all your spray-coating requirements

FOR TOTAL SERVICE, CALL
DEVILBISS

THE DeVILBISS COMPANY, Toledo 1, Ohio. Also Barrie, Ontario; London, England; São Paulo, Brazil. Branch offices in principal cities.

DU PONT TRICLENE® TRICHLORETHYLENE FINISHING NEWS



As shown, auto parts on a monorail conveyor are hot dip painted at Ford's Sterling, Michigan, plant.

Ford Motor Co. uses nonflammable "Triclene" Painting—saves space, time, money—can finish 24,000 parts per day

The Ford Motor Company wanted a safe, nonflammable, production-line method of painting front-end suspensions. The answer was the Du Pont "Triclene" Painting Process. This installation has been in operation for 4 years!

Because "Triclene" is nonflammable, fire hazard was reduced, and saved Ford Motor Company the cost of additional fire-protection equipment. Because parts emerge dry, no costly drying ovens or drip areas were required, which also resulted in substantial floor-space savings.

Quality production is maintained at a high level. Parts can move through the paint unit in one minute at a rate of over 2,000 an hour: 24,000 a day. They dry almost at once, leaving a paint film of excellent coverage and uniformity. Parts are immediately packed and shipped to the assembly plant.

"TRICLENE" Finishing is a revolutionary new way to finish metals. Clean, phosphatize and dip or spray paint continuously in a single medium of nonflammable "Triclene" trichlorethylene. Use processes singly or in combination to suit any metal finishing need.

Check these important advantages of "TRICLENE" Painting

- ***NONFLAMMABLE.*** "Triclene"-thinned paints increase safety . . . minimize fire hazards. Need for expensive fire-protection equipment is eliminated, and insurance premiums are often reduced.
- ***SAVES SPACE.*** No drying ovens needed where lacquer-type paints are used. Drip pans aren't required, either. "Triclene" Painting installations generally require less than half the space required by conventional methods of production-line painting.
- ***ECONOMICAL.*** No overspray or drip losses means that all paint bought is used effectively. This can cut operating costs as much as 30%.
- ***VERSATILE.*** "Triclene" method of painting can be done by hot dip or spray-in-vapor cycles. Method can be combined readily with "Triclene" Vapor Degreasing and/or Phosphatizing Processes.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Du Pont will help you evaluate "Triclene" Painting— or send you up-to-date literature

For more information about the process, fill out the coupon below. If all you need at this point is information, just check the pertinent box, and we'll see that you get up-to-date literature. If, however, you have a specific need or would like to evaluate "Triclene" Painting, Du Pont will initiate the following evaluation program:

1. You'll receive a *confidential* questionnaire in which to describe your finishing problem. This information is used by Du Pont in preparing a cost analysis which compares a "Triclene" Painting System with other systems based on conventional methods.

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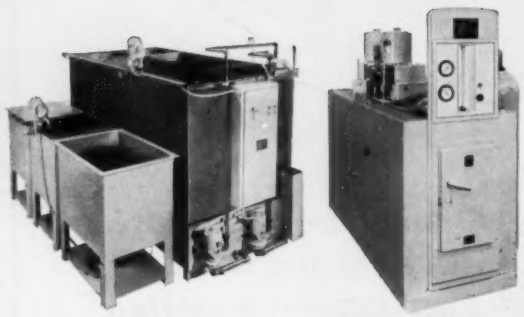

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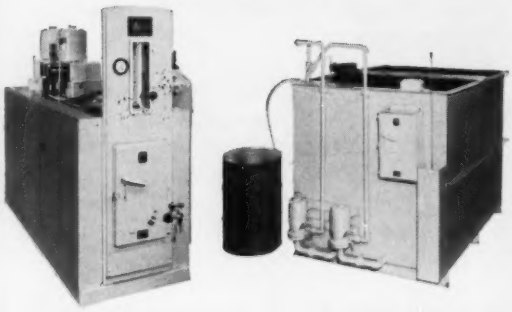

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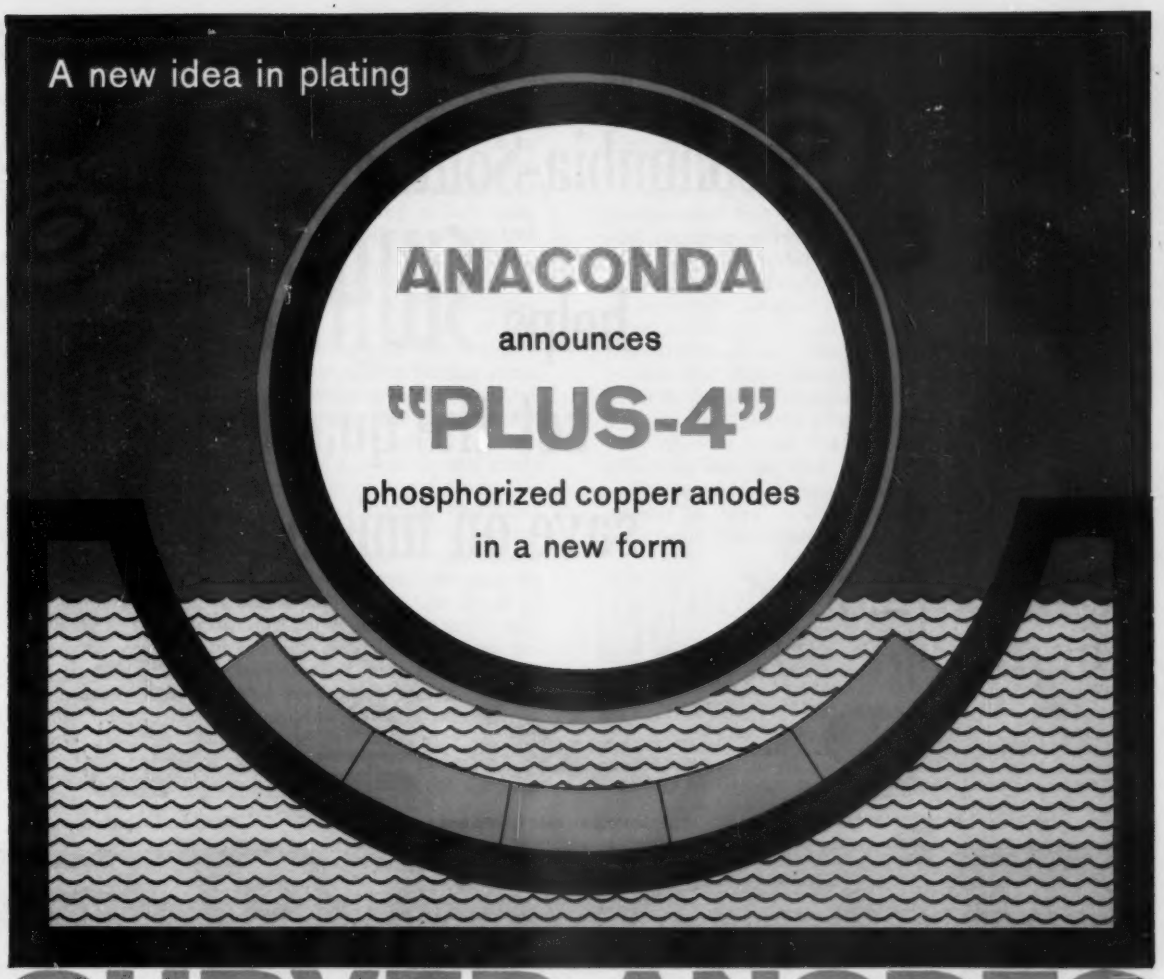

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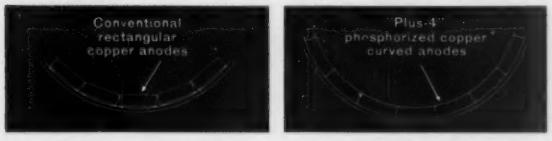
for plating cylinders faster and more uniformly

To make anode surfaces parallel the rotogravure cylinder being plated, and to fit the curve of the current-carrying slings, Anaconda "Plus-4" phosphorized copper anodes are now extruded to precisely curved shapes.



This design gives both cost savings and improved cylinder quality:

1. A more evenly plated cylinder. Because the distance between the cylinder and the anode surface is more uniform, the copper deposit is smoother and more uniform.

2. Finishing operations in most cases are reduced, as much as 50%, because of the uniform copper deposit.

3. Less scrap because anodes corrode more evenly.

4. Improved electrical efficiency and faster plating because of better contact with sling.

For more information, write: Anaconda American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

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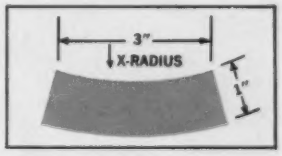
Note: When you request information, please specify inside radius of anode.



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Anaconda American Brass Company

vapor degreasing in Columbia-Southern Trichlor helps SWANK INC. set the quality pace, save on finishing costs

Natural topaz cuff link

Monogrammed tie clip and cuff link

Hand carved jade cuff link

Gleam of quality and appeal of unusual design characterize this selection of men's accessories from the Swank collection. Recent additions to the line include a full selection of small gift items and watches for men and women.

Attleboro, Massachusetts—Craftsmanship is a tradition in this New England jewelry center where Swank, Inc. produces its world-famous line of personal jewelry for men. Top quality in every price range demands care in manufacturing methods backed up with smart cost-control to keep them competitive. That's why vapor degreasing with such solvents as Columbia-Southern TRICHLOR was a natural to help Swank management meet the dual needs of effective cleaning at low cost.

Thousands of tiny parts made of all the decorative metals from brass and bronze to gold, silver, rhodium and others are buffed to a quality glow before final processing or protective plating. Since finish bespeaks quality in jewelry, no blemish-causing bits of soil could remain after the final cleaning step. The variety of metals to be processed, the tenacious buffing compounds to be removed without affecting the surface and the need for economy, gave the production department a real challenge.

Vapor degreasing was Swank's answer to the challenge. Taking advantage of modern equipment and the dependable quality of supplies like Columbia-Southern Trichlor with its heavy duty neutral stabilizing system, they were able to set up an efficient rate of continuous production without expensive shut down. Swank buys its Trichlor through Kraus Distributing Company of Providence, who also supplies other finishing materials.

A typical example of problem-solving teamwork between distributor and technical service from PPG's Chemical Division occurred recently which points up the value of well-informed suppliers. Swank was experiencing a mysterious build-up on the filters and distillation equipment which prevented proper operation of their large degreasing machine. A hurry-up call for help brought the distributor and the PPG representative. Sticking with the job until solved, they came up with the reason—an extra heavy load of insoluble spinning compound on parts being cleaned—and the solution, which involved adjusting the through-put rate and the method of work handling. Result: a return to production in a short time, with resultant savings.

Swank has found that Columbia-Southern Trichlor meets every test of quality and performance as a low-cost cleaning solvent in vapor degreasing. Trichlor is tailor-made for today's high production rates. It is produced under "Triple-check" quality control during manufacture for purity, uniformity and stability. This super-stabilized system helps protect your equipment from acid build-up. Finally, it is sold nationwide, through experienced distributors and backed up by qualified PPG Chemical Division technical service engineers. No wonder leaders like Swank of Attleboro look to Columbia-Southern Trichlor to keep them on target in efficiency and low cost.

For more details on vapor degreasing—the modern answer to metal cleaning—call your Trichlor distributor or our district office nearest you.

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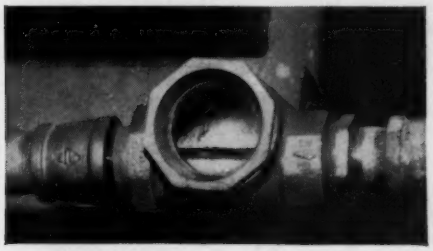
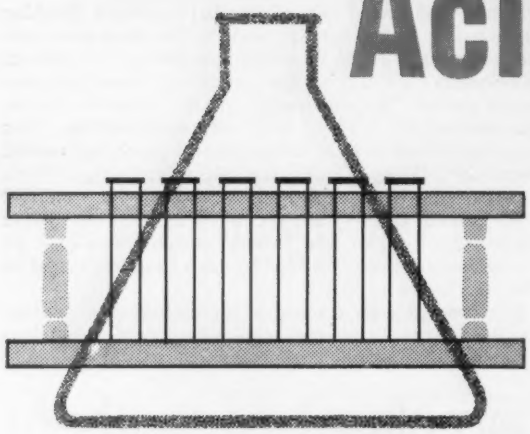
Bill Lovenbury of Swank and Martin Kraus of Kraus Distributing Company, Trichlor distributors, inspect a rack of belt buckles which are clean, dry and ready for final plating. Swank designed many of its own work-handling racks and baskets to insure complete exposure to solvent.



Clear Trichlor flows past the sight glass after distillation, ready for more cleaning mileage. Swank has improved costs with many ingenious modifications of equipment, and increased awareness of solvent use by metering the solvent supplied to every department.

Mechanized vapor degreasing machine charged with Trichlor meets Swank's need for high production and economy. Combination of liquid spray and vapor rinse gives superior results in short time. Return conveyor system simplifies handling (one man loads and unloads) and reduces solvent loss.

Fluoboric Acid and METALLIC FLUOBORATES by HARSTAN



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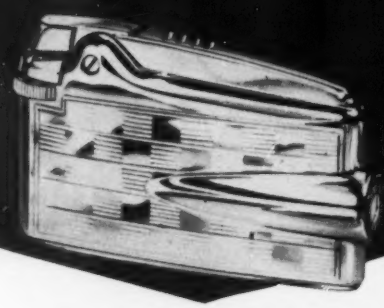

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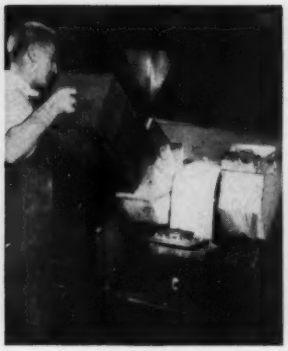

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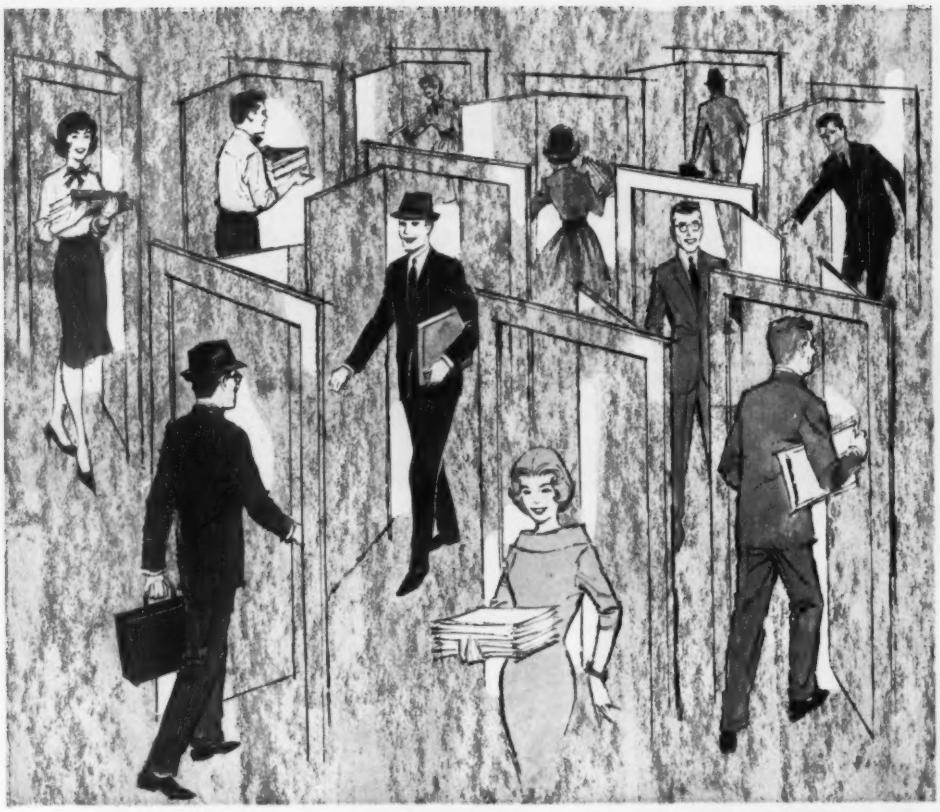

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MAY, 1961 Volume 59 No. 5

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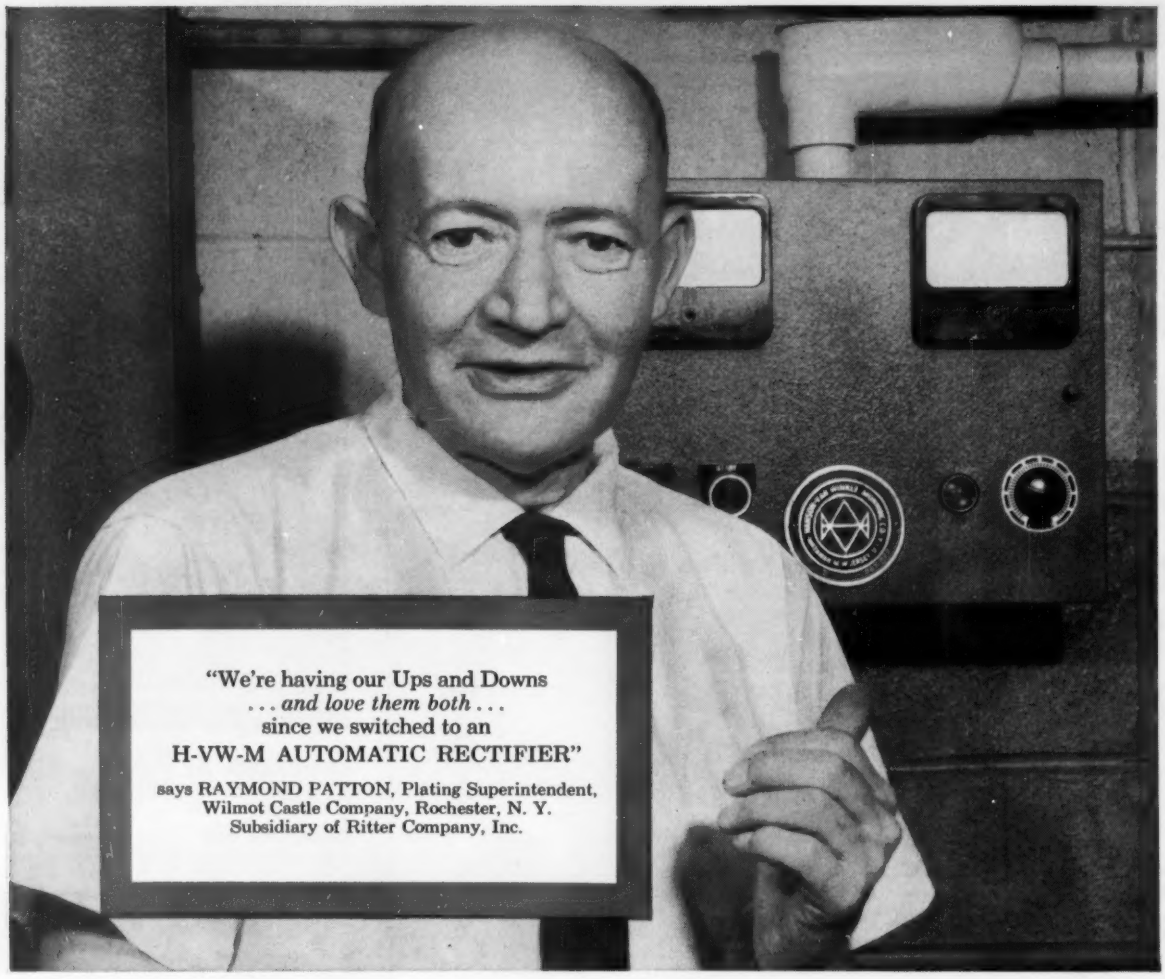
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Wilmot Castle Company, Rochester, N. Y.
Subsidiary of Ritter Company, Inc.

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Requirements for current vary widely in the chrome-plating operations of Wilmot Castle Company, one of the largest makers of sterilizers, lamps, and other hospital, dental, surgical equipment.

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Says Ray Patton, Wilmot Castle's plating superintendent: "We're gradually retiring all our rectifiers of the tap-switch type—and putting in H-VW-M units that practically think for themselves. We've found that what they seem to think about the most is ways to up our production, cut our costs down."

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WHO SHOULD KNOW BETTER?

In the opinion of this admittedly not-unbiased editor, the stature of the metal finishing supervisor today is best evidenced by the increasing reliance on his judgment acknowledged by the other members of the production team. It wasn't many years ago that only cursory attention was paid to the finishing department, and it took some expensive lessons to awaken management to the importance of this phase of the manufacturing process.

As product advertising placed more emphasis on the quality, the durability and the attractiveness of the finish, the finisher became saddled with greater responsibility. As the finishing department began to represent an impressive capital investment, and its operation to account for a more significant percentage of the total cost of production, the respect accorded the finishing superintendent mounted in proportion.

Rarely these days is the design of a part to be plated finalized without including the plater's suggestions for avoiding problems of rack shading, throwing power, and solution drainage. Few production vice presidents would consider the purchase of finishing equipment, whether it be as inexpensive as a spray gun or as costly as an automatic machine, without consulting the finishing department head. We know that some engineering departments occasionally prepare finishing standards without conferring with the one really qualified man on the payroll. How else to explain a specification calling for a barrel nickel plated steel stamping to withstand a 96 hour salt spray test? Fortunately, repercussions in such cases act to limit future disregard of what, ordinarily, would be considered an obvious precaution.

Because of the specialized character of finishing processes, it is not only customary for the department supervisor to decide his equipment and material requirements, but he very often will also specify their source, especially supplies which are of a proprietary nature. What purchasing agent would have the temerity to order, on his own authority, any particular buffing composition or platers' cleaner? Even in the case of common chemicals and solvents, the possibility of some drawback of which he might be unaware often impels him to obtain the finisher's approval for purchase of a certain brand.

The exceptional position of authority he holds, places on the finisher the additional burden of following more closely than ever all new developments. The salesman knows that, if he expects to sell at all, he first must sell the finishing supervisor, and it helps if his firm's advertising message is also focused in the same direction. Not only does it prepare the way, but it creates good will. It insures that the man who influences the purchase is familiar with the company and product, in time to be prepared with facts when pressed by the design, engineering, production, or quality control departments.

Nathaniel Hall

Finishing to Government Specifications

By Boris B. Joffe

Boris B. Joffe is president of Twin City Testing Corp., Tonawanda, N. Y. His firm serves the metal finishing industry as manufacturers of and consultants on electronic testing equipment. He is a member of the National Association of Metal Finishers, American Society for Metals, Institute of Metal Finishing (Great Britain), and the American Electroplaters' Society. Mr. Joffe pursued courses leading to a Master of Science degree at the Sorbonne in Paris. His post-graduate studies toward a Ph.D. degree were interrupted by the outbreak of World War II.

THE performance of a plating job according to government specifications requires the purchase or work order to be absolutely specific about the finish to be applied. As many specifications classify the finish by a class and type number, it is necessary that both of these requirements be clearly spelled out.

The order should also clearly define if the part is to be hydrogen-embrittlement relieved after plating, especially since this operation depends mostly on the hardness of the part or its application, and since these two characteristics are unknown to the finisher. When plating threaded parts, the finisher will note that most specifications waive thickness requirements if dimensional tolerances have to be met.

When plating to specifications, the required coating thickness is generally the minimum thickness of the deposit. An irregularly shaped part must have this thickness at every point of its surface, except on those areas which are exempted by the specification itself.

Last, but not least, it is important to mention that good adhesion is considered in all plating specifications to be a condition, sine qua non. The finisher is advised to check the finished parts, especially when they have been hydrogen-embrittlement relieved, as many parts will show blisters after this operation, even if they were not apparent before.

Despite the fact that most platers are familiar with the following specifications, their knowledge seems to be limited to the thickness requirements. In order to give the greatest accuracy possible to this resume, many phrases have been transcribed word for word. On the other hand, where the shortening of a paragraph or phrase would help to clarify a meaning, this latter method was adopted.

Anodic Coatings for Aluminum and Aluminum Alloys

Military Specification MIL-A-8625A (Dec. 14, 1954)

I. CLASSIFICATION:

Anodic coatings shall be of the following types:

Type I: Chromic acid coatings.
Type II: Sulfuric acid coatings.

Where dyed coatings are required, the word "dyed," and the color, shall follow the type of anodizing specified.

II. REQUIREMENTS:

The basis metal shall be free from surface defects detrimental to the appearance or functional use of the coating.

Insofar as practicable, articles shall be anodized after all heat treatments and mechanical operations have been completed.

Articles to be anodized shall be handled carefully before, during, and after anodizing, in order to prevent mechanical damage or contamination.

Mechanically damaged areas from which the coating has been removed may be repaired by using chemical processes meeting specification MIL-C-5541.

The quality of the anodic coating may be controlled either by anodic coating weight or by corrosion resistance; except that, unless otherwise specified, the former method shall be employed.

Despite the fact that coatings of both types have to withstand a salt spray exposure of 240 hours, the minimum anodic coating weights shall be as follows:

Anodic Coatings	*Milligrams per sq. ft.*		*Milligrams per sq. dm.*	
	Nondyed	*Dyed*	*Nondyed*	*Dyed*
Type I	200	500	22	54
Type II	600	2,500	65	270

These requirements are somewhat modified for parts which are bulk anodized, such as rivets, screws, etc.

When the anodic coating weight method of quality control is employed, the anodizing shall be operated within the following limits:

Coating Type	Steady Voltage	Minimum Current Density at the Anode amp./sq. ft.	Solution Temperature °F.
I Non-dyed	38 - 42	1 (min.)	90 - 95
I Dyed	38 - 65	1 (min.)	90 - 122
II Non-dyed	as required	12 (average)	68 - 72
II Dyed	as required	16 (average)	68 - 88

The specification further gives details of the post anodic treatments.

Type I Coatings		Type II Coatings	
Non-dyed	Dyed	Non-dyed	Dyed
Water rinsed[1]	Water rinsed	Water rinsed	Water rinsed
Dried	Dyed	Sealed[2]	Dyed
	Water rinsed	Water rinsed	Water rinsed
	Water sealed[3]	Dried	Sealed
	Dried		Water rinsed

1. Final rinse temperature 150°F. minimum.
2. Temperature 208°-212°F., 15 minutes, 5 percent dichromate, pH 5.0-6.0.
3. Temperature 208°-212°F., 5-10 minutes, pH 5.6-6.4.

Anodized parts should be dried at temperatures not exceeding 225°F.

Anodic coatings to be dyed should not be allowed to dry before dyeing.

a.) *Type I coatings*

When the chromic acid concentration of the anodizing bath is 10%, or greater, the required minimum current density may be obtained by addition of sulfuric acid (with a maximum of 80 g./l.).

Type I coatings shall not be applied to alloys with a nominal copper content in excess of 5.0% or when the total content of alloying elements exceeds 7.5%.

b.) *Type II coatings*

Type II coatings shall not be applied to parts or assemblies which contain joints or recesses in which the anodizing solution might stay trapped. If a Type I coating is also inapplicable to these parts (see above), they shall not be anodized.

Unless otherwise specified, Type II coatings shall be sealed by immersion in a water solution of sodium or potassium dichromate. The concentrations used shall be a minimum of 1 and 5 percent for dyed and non-dyed, respectively.

III. TESTING:

For inspection purposes, the sampling procedures and frequencies outlined in this specification shall be used. In no case shall the process inspection be less frequent than once each week, and anodic coating weight determinations less frequent than once a month for each tank. If the tank is not in use for a week or more, its performance shall be tested by the coating weight method before it is reused.

The anodic coating weight determination shall be accomplished in stripping the anodizing from an anodized test panel in a phosphoric-chromic acid solution, and in weighing same before and after stripping.

Salt spray tests shall be made once a month if the production is continuous; where production is intermittent, the interval between tests shall not exceed 6 months.

Cadmium Plating (Electrodeposited)

Federal Specification QQ-P-416a (Dec. 11, 1956)

I. CLASSIFICATION:

Cadmium plating shall be of the following classes:

Class 1. — 0.0005 inch thick
Class 2. — 0.0003 inch thick
Class 3. — 0.0002 inch thick

and of the following types:

Type I — Without supplementary chromate or phosphate treatment
Type II — With supplementary chromate treatment
Type III — With supplementary phosphate treatment.

II. REQUIREMENTS:

The basis metal shall be substantially free from defects detrimental to the appearance or the protective value of the plating.

The plating shall be free from defects and of good appearance. Superficial staining resulting from rinsing, or slight discoloration resulting from baking, shall not be cause for rejection.

Unless otherwise specified, the plating shall be applied after all basis metal heat treatments and mechanical operations on the part to be plated have been completed.

All steel parts having a hardness greater than Rockwell C 40 shall be stress relieved prior to plating if they contain objectionable residual stresses.

Springs or other parts, having a hardness greater than Rockwell C 40 and subject to flexure or repeated impact, shall be baked at 375° ± 25°F. for three hours after plating. Hardened parts, 220,000 p.s.i. and above, and carburized parts shall not be heated as above.

Cadmium shall be deposited directly on the basis metal, except on stainless steel or aluminum parts, on which an intermediate coating is permissible.

Unless otherwise specified, either a bright or dull finish will be acceptable.

As cadmium plated articles packed in nonventilated containers may corrode, the instructions for packing contained in this specification should be followed.

a.) *Type II and III Coatings*

Coatings produced by bright dips of any kind shall not be considered as falling into the Type II classification; Type II coatings shall be distinctly colored.

The baking operation after plating shall be given prior to the application of supplementary coatings. If the cadmium surfaces become passive as a result of this operation, they may be reactivated by a short dilute acid dip.

As chemically obtained Type II coatings are fragile while wet, care should be exercised in the handling of parts covered with such coatings.

Type II coatings shall show no white corrosion products when exposed for 96 hours to salt spray.

Type III coatings shall be submitted to the water-resistance test outlined in this specification.

III. Sampling and Testing:

For inspection purposes, the sampling procedure outlined in this specification shall be used. Adhesion shall be tested either by the bend test or by scraping the coating off the basis metal.

Separate specimens shall not be used for thickness measurements unless the necessity for their use has been demonstrated.

Unless otherwise specified, no thickness requirements are to be met on surfaces which cannot be touched by a sphere 0.75 inch in diameter. Thickness measurements shall be made on the plated article where the plating would be expected to be at a minimum. Measurements on bolts shall be made on the shank, or on the head, if the shank is completely threaded.

Thickness measurements of Type II and III coatings shall be made after the application of the conversion coating and its subsequent removal from the spot to be tested.

Thickness measurements may be made by the drop test, by approved instruments, or by means of the metallographic microscope; the latter method shall be used as a referee test.

IV. Departmental Requirement:

1.) *Air Force, Army and Bureau of Aeronautics:*

Unless otherwise specified, cadmium plating for aeronautical use shall be Type I, Class 2, with the following exceptions:

a.) Bolts, studs, washers, and articles with portions externally threaded. Those parts shall have a minimum of Class 3 thickness.

b). Parts, whose dimensional tolerances will not permit a Class 2 thickness, shall be given a maximum thickness compatible with dimensional tolerances.

c.) Holes, recesses, internal threads and other areas where a controlled deposit cannot be normally obtained shall not be subject to a thickness requirement.

Chromium Plating (Electrodeposited)

Federal Specification QQ-C-320 (July 26, 1954)

I. Classification:

Chromium plating shall be of the following classes:

Class 1: Decorative plating.
Class 2: Engineering plating plated to specified dimensions or processed to specified dimensions after plating.

Class 1 plating shall be of the following types:

Type I: Bright
Type II: Satin

II. Requirements:

The basis metal shall be free from defects detrimental to the appearance or performance of the plating.

The plating shall be free from defects and of good appearance. Slight discoloration resulting from baking after plating shall not be cause for rejection.

Unless otherwise specified, the plating shall be applied after all basis metal heat treatments and mechanical operations on the part to be plated have been completed.

All steel parts, having a hardness greater than Rockwell C 40, shall be stress relieved prior to plating if they contain objectionable residual stresses.

a.) *Class 1 plating*

Unless otherwise specified, Class 1 plating shall be applied over an intermediate coating of nickel, or nickel over copper, according to Specification QQ-N-290, (Nickel Plating); the minimum thickness of the chromium coating shall be 0.00001".

Unless otherwise specified, no thickness requirements are to be met on surfaces which cannot be touched by a sphere 0.75 inch in diameter.

As chromium coatings of 0.00005 inch or more in thickness are likely to crack nickel plating on brass, the minimum chromium thickness of 0.00001 inch should be obtained under conditions such that the maximum thickness remains under 0.00005 inch.

b.) *Class 2 plating*

Unless otherwise specified, Class 2 plated steel parts, having a hardness of Rockwell C 40 or higher, shall be heated to 375° ± 25°F., for not less than three hours, after plating. If the hardness of the plated parts would be affected by this heat treatment, they shall be baked at 275° ± 10°F., for not less than five hours. Completely plated parts or parts of which the surfaces are subject to fatigue stresses, shall not be baked but treated as specified by the procuring agency.

The plated articles described above do not need to be baked if the procuring agency deems such a treatment to be unnecessary.

The chromium thickness shall be as specified by the procuring agency and shall apply after all grinding operations have been completed.

If additional corrosion protection is required from a ferrous part, an undercoat of nickel from 0.001 to 0.002 inch may be used.

If selective plating is required, the coating shall blend smoothly into the unplated surface.

III. Sampling and Testing:

For inspection purposes, the sampling procedure outlined in this specification shall be used.

Adhesion shall be tested either by the bend test, or by cutting the coating from the basis metal with a sharp instrument.

Separate specimens shall not be used for thickness measurements unless the necessity for their use has been demonstrated.

Thickness measurements shall be made on the plated articles where the plating would be expected to be at a minimum. Measurements on threaded articles shall be made on the shank or other smooth surfaces as close to the threads as possible.

The thickness of Class 1 coatings shall be determined by the hydrochloric acid spot test. If the chromium is not deposited over nickel, this method may be replaced by another approved method.

Thickness measurements of Class 2 coatings may be made by gages, instruments, or by means of the metallographic microscope, as long as the method used will give a reading within plus or minus 10 percent of the true coating thickness.

IV. Departmental Requirements:

1.) *Air Force and Bureau of Aeronautics:*

Unless otherwise specified, the minimum thickness for Class 2 deposits shall be 0.002 inch.

2.) *Navy (Bureau of Ships and Bureau of Ordnance):*

Unless otherwise specified, all plated articles, subject to fatigue stresses, shall have the surfaces to be plated shot-peened prior to plating, and shall not be baked after plating.

Nickel Plating (Electrodeposited)

Federal specification QQ-N-290 (April 5, 1954)

I. Classification:

Nickel plating shall be of the following classes:

Class 1: Decorative plating.
Class 2: Engineering plating, plated to specified dimensions or processed to specified dimensions after plating.

Class 1 plating shall be of the following types:

Type I or DS, Type II or FS, Type III or KS, Type IV or QS, Type V or FC, Type VI or KC, Type VII or QC, Type VIII or FZ, Type IX or KZ, Type X or QZ. (The letter symbols are designations of the A.S.T.M.).

II. Requirements:

The basis metal shall be free from defects detrimental to the appearance or the performance of the plating.

The plating shall be free from defects and of good appearance. Slight discoloration resulting from baking after plating shall not be cause for rejection.

Unless otherwise specified, the plating shall be applied after all basis metal heat treatments and mechanical operations on the part to be plated have been completed.

All steel parts, having a hardness greater than Rockwell C 40 and subject to flexure or repeated impact, shall be baked at 375° ± 25°F. for three hours after plating. Hardened parts, which have been heat treated previously at a temperature below 375°F., including carburized parts, shall not be heated as above.

The plated articles described above do not need to be baked if the procuring agency deems such a treatment to be unnecessary.

Unless otherwise specified, no minimum thickness requirements are to be met on surfaces which cannot be touched by a sphere 0.75 inch in diameter.

a.) *Class 1 plating*

Class 1 plating is intended for decorative plating. The minimum thickness of Class 1 plating shall conform to the table below:

b.) *Class 2 plating*

Class 2 plating is intended for wear and abrasion resistance. Unless otherwise specified, Class 2 plating shall have a minimum thickness of 0.003 inch.

The thickness requirement shall apply after all mechanical and finishing operations have been completed.

If selective plating is required, the coating shall blend smoothly into the unplated surface.

III. Sampling & Testing

For inspection purposes, the sampling procedure outlined in this specification shall be used.

Adhesion shall be tested either by the bend test or by cutting the coating from the basis metal with a sharp instrument.

Separate specimens shall not be used for thickness measurements unless the necessity for their use has been demonstrated.

Thickness measurements shall be made on the plated article where the plating would be expected to be at a minimum. Measurements on threaded articles shall be made on the shank or other smooth surfaces as close to the threads as possible.

Thickness measurements may be made by gages, instruments, or by means of the metallographic microscope as long as the method used will give a reading within plus or minus 10% of the true coating thickness; the microscopic method shall be used for referee tests.

IV. Departmental Requirements:

1. *Air Force and Bureau of Aeronatuics:*

Unless otherwise specified the minimum nickel thickness for Class 2 deposits shall be 0.001 inch when the basis metal is ferrous and 0.0005 inch when the basis metal is nonferrous.

	Steel basis metal Type[1]				*Copper and copper-alloy basis metal Type*[1]		
	DS	*FS*	*KS*	*QS*	*FC*	*KC*	*QC*
Nickel	0.0010	0.0006	0.0004	0.0002	0.0005	0.0003	0.0001
Nickel plus copper[2]	0.0020	0.00125	0.00075	0.0004	------	------	------
Copper undercoat	Optional	------	------	------	[3]	------	------

	Zinc-alloy basis metal Type[1]		
	FZ[4]	*KZ*[4]	*QZ*[5]
Nickel	0.0005	0.0003	0.0003
Nickel plus copper	0.00125	0.00075	0.0005
Copper undercoat	0.0004	0.0003	0.0002

1. Explanation of symbols: The letter designations S, C, and Z, refer to steel, copper and zinc; the letters D, F, K, and Q are arbitrary designations of types of plating.
2. Class 1 platings including copper undercoat are ordinarily used as undercoat systems for 0.00001-inch electrodeposited chromium.
3. Copper alloys containing zinc equal to or greater than 40 percent shall have a copper undercoat of 0.0003 inch minimum thickness.
4. Copper undercoat may be omitted from type FZ and type KZ; the minimum nickel thicknesses shall be as specified for nickel plus copper for these types.
5. Copper undercoat may be omitted.

Note: It seems evident that a typographical error is at the base of this requirement, as it should apply to Class 1 coatings and not to Class 2 coatings.

The author of this article brought this fact to the attention of the competent authorities who concurred fully with his interpretation and have requested the issuance of an amendment to this specification, correcting this error.

2. *Navy (Bureau of Ships only)*:

Unless otherwise specified, Class 1 deposits shall be Type DS for ferrous materials, Type FC for copper and copper alloys, and Type FZ for zinc alloys. For ferrous materials, the nickel plating shall be deposited in two approximately equal layers. The first nickel layer shall be buffed or otherwise cold worked prior to the deposition of the second nickel layer.

Silver Plating (Electrodeposited)

Federal Specification QQ-S-365a (April 6, 1959).

I. Classification:

Silver plating shall be of the following types:

Type I — Matte
Type II — Semi-bright
Type III — Bright

and of the following grades:

Grade A: With supplementary tarnish-resistant treatment (chromate treated).
Grade B: Without supplementary tarnish-resistant treatment.

The different types of deposits are defined as follows:

Matte — Deposits without luster, normally obtained from cyanide plating solutions without brighteners.

Semi-bright — Semi-lustrous deposits, normally obtained from cyanide plating solutions with brighteners.

Bright — Sometimes obtained by polishing or by use of "brighteners."

II. Requirements:

The basis metal shall be free from defects detrimental to the appearance or performance of the plating.

The plating shall be free from defects and of good appearance. Superficial staining shall not be a cause for rejection.

Unless otherwise specified, the plating shall be applied after all basis metal heat treatments and mechanical operations on the part to be plated have been completed.

All steel parts, having a hardness greater than Rockwell C 40, shall be stress relieved prior to plating if they contain objectionable stresses.

Springs or other parts, having a hardness greater than Rockwell C 40 and subject to flexure or repeated impact, shall be baked at 375° ± 25°F. for three hours after plating. Hardened parts, which have been heat treated previously at a temperature below 375°F., including carburized parts, shall not be heated as above.

The plated articles described above do not need to be baked if the procuring agency deems such a treatment to be unnecessary.

The final silver deposit shall be preceded by a coating obtained from a silver strike solution. Intermediate coatings of nickel, copper, etc. may be used.

If the type of plating is not specified, either one of the three types will be acceptable.

Unless otherwise specified, the minimum plating thickness shall be 0.0005 inch of silver on all surfaces on which silver is functionally necessary. On ferrous surfaces the total plated thickness shall be not less than 0.001 inch. This total thickness shall be comprised of at least 0.0005 inch of silver plate, and 0.0005 inch or over of an undercoating of copper, nickel, or any combination of these two metals.

This specification also covers the roughness and the solderability of the silver coating.

A Grade A plate shall consist of a plate made tarnish resistant by treatment with a chemical solution; an organic coating, applied to this effect, is not permissible.

III. Sampling and Testing:

For inspection purposes, the sampling procedure outlined in this specification shall be used.

Adhesion shall be tested either by the bend test or by scraping the coating off the basis metal.

The surface roughness may be measured by the Profilometer, the Brush Surface Analyzer, or other approved techniques.

The solderability test shall consist of immersing a previously fluxed test specimen in a specified solder, and then submitting it to the bend test.

The tarnish resistance test, for Grade A plate only, shall be made by applying a specified ammonium sulfide solution for five minutes.

Separate specimens shall not be used for thickness measurements unless the necessity for their use has been demonstrated.

Unless otherwise specified, no thickness requirements are to be met on surfaces which cannot be touched by a sphere 0.75 inch in diameter. Thickness measurements shall be made in several representative locations on each item. Measurements on threaded fasteners shall be made on the shank or other smooth surfaces as close to the threads as possible.

Thickness measurements may be made by gages, instruments, or by means of the metallographic microscope as long as the method used will give a reading within plus or minus 10% of the true coating thickness; the microscopic method shall be used for referee tests. This specification also permits thickness determination by the chord method and the stripping method.

Zinc Plating (Electrodeposited)

Federal Specification QQ-Z-325a (May 13, 1959, amended 4/8/60)

I. Classification:

Zinc plating shall be of the following types:

Type I — Without supplementary chromate or phosphate treatment
Type II — With supplementary chromate treatment
Type III — With supplementary phosphate treatment

and of the following classes:

Class 1 — 0.0010 inch thick
Class 2 — 0.0005 inch thick
Class 3 — 0.0002 inch thick

II. REQUIREMENTS:

Anodes and baths containing mercury shall not be used for zinc plating.

The basis metal shall be substantially free from defects detrimental to the appearance or the protective value of the plating.

The plating shall be free from defects and of good appearance. Superficial staining resulting from baking shall not be a cause for rejection.

Unless otherwise specified, the plating shall be applied after all basis metal heat treatments and mechanical operations on the part to be plated have been completed.

All steel parts, having a hardness greater than Rockwell C 40, shall be stress relieved prior to plating if they contain objectionable residual stresses.

All steel parts, having a hardness greater than Rockwell C 40 shall be baked at 375° ± 25°F. for three hours after plating. Quench-hardened parts, which have been tempered previously, including case carburized parts, shall be baked after plating at a temperature below the tempering temperature by at least 50°F.

Zinc shall be deposited directly on the basis metal, except on stainless steel parts, on which an intermediate coating is permissible.

Unless otherwise specified, either a bright or dull finish will be acceptable.

Zinc plated articles should not be packaged in non-ventilated containers unless the containers are dehydrated with a dessicant or the plated articles are treated with a corrosion preventive compound.

a. *Type I and Type III coatings*

Type I and Type III coatings shall be able to withstand salt spray exposure as outlined in the following table:

Class	*Test period for corrosion of basis metal, hours*
1	192
2	96
3	36

Type III coatings may be submitted to the water resistance test outlined in this specification.

b. *Type II coatings*

Type II coatings shall be distinctly colored. The hexavalent chromium content of the chemically formed chromate coating shall be at least 25 micrograms per square inch as determined by the diphenylcarbazide method.

The baking operation after plating shall be given prior to the application of supplementary coatings. If the zinc surfaces become passive as a result of this operation, they may be reactivated by a short dilute acid dip.

As chemically obtained Type II coatings are fragile while wet, care should be exercised in the handling of parts covered with such coatings.

Type II coatings shall show no white corrosion products when exposed for 96 hours to salt spray.

III. SAMPLING AND TESTING:

For inspection purposes, the sampling procedure outlined in this specification shall be used.

Adhesion shall be tested either by the bend test or by scraping the coating off the basis metal.

Separate specimens shall not be used for thickness measurements unless the necessity for their use has been demonstrated.

Unless otherwise specified, no thickness requirements are to be met on surfaces which cannot be touched by a sphere 0.75 inch in diameter. Thickness measurements shall be made on the plated article where the plating would be expected to be at a minimum. Measurements on threaded articles shall be made on the shank or other smooth surfaces as close to the threads as possible.

Thickness measurements of Type II and Type III coatings shall be made after the application of the conversion coating, and its subsequent removal from the spot to be tested.

Thickness measurements may be made by the drop test, by approved instruments or by means of the metallographic microscope; the latter method shall be used as a referee test.

IV. DEPARTMENTAL REQUIREMENTS:

A. *Air Force, Quartermaster Corps, and Bureau of Aeronautics*:

Unless otherwise specified in the contract or order, zinc plating shall be Type II and the thickness requirement shall be Class 2, unless otherwise specified or controlled by the following exceptions:

1. Bolts, studs, washers, and articles with portions externally threaded. Those parts shall have a minimum of Class 3 thickness.

2. Parts whose dimensional tolerances will not permit a Class 2 thickness shall be given a maximum thickness compatible with dimensional tolerances.

3. Holes, recesses, internal threads and other areas where a controlled deposit cannot be normally obtained shall not be subject to a thickness requirement.

Salt spray testing of Type I and Type III plating shall not apply.

Electrolytic Destruction of Cyanide Residues

By John M. Connard, *Chief Metallurgist and*

G. Paul Beardsley, *Plating Engineer, Shakeproof Division, Illinois Tool Works, Elgin, Ill.*

THE Shakeproof Division of the Illinois Tool Works located in Elgin, Illinois, manufactures the well-known line of Sems, which are the familiar pre-assembly of a machine screw and a twisted tooth lockwasher, thread cutting screws, Keps, which are nuts pre-assembled with a lockwasher, and other special fastening devices. With respect to plating wastes, they may be considered a typical metal working plant making large quantities of small bulky parts. In meeting customer requirements for resistance to corrosion and for decorative purposes, the Division has a large electroplating and surface finishing department which processes their parts on a bulk basis.

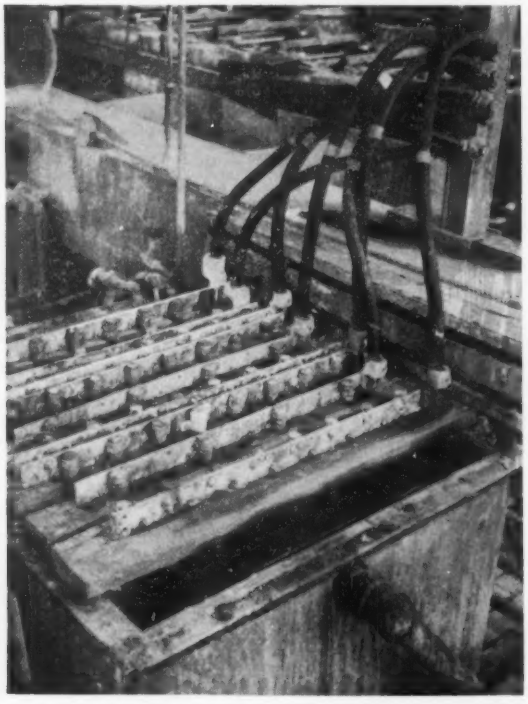


Fig. 1. View of electrical destruction tank with cover removed.

Much of the electroplating involves cadmium, zinc, and copper from cyanide solutions, and a number of years ago a conventional flow-through chlorination waste treatment system was installed for the destruction of cyanides in the plant effluent. Briefly, this system involves collecting the rinse waters from all the operations in a sump under the plating department floor, from where they are pumped to a large holding and mixing tank. On leaving this tank, the effluent is treated with chlorine and caustic soda to destroy the cyanide and adjust the pH to an acceptable level. The amount of chlorine added is determined by frequent chemical analyses and is controlled from the laboratory through a remote system. While the caustic feed is automatically maintained by a continuous monitoring pH meter, the pH is checked by the laboratory to safeguard against malfunctioning of this equipment. From this treatment, the effluent passes through a heavily baffled reaction tank and discharges to the city sewer.

While this system has proved quite satisfactory for the treatment of the normal daily effluent, a problem has been encountered in destroying miscellaneous collections of cyanide-bearing materials. These include residues from the cleaning of plating tanks, residues from heat exchangers, spent stripping solutions, filter cake sludges, and scrapings from plating tank exhaust systems. The cyanide content of these materials obviously varies widely, depending upon their source. Generally, they are quite concentrated, with the cyanides running as high as 80,000 p.p.m. As a consequence, they cannot be destroyed on a practical basis in the normal treatment system, and require special treatment. Previously, they were boiled until the free cyanide concentration was about zero and the total cyanide content below 1,000 p.p.m. The resultant solution was then pumped slowly into the daily effluent, and the remaining cyanide treated with chlorine. This method proved inadequate, as sludge was frequently

collected faster than it was being destroyed in the equipment available. Therefore, it was thought that a faster method should be found. Trials were made of adding calcium hypochlorite to the partially decomposed solutions. While this method speeded the complete destruction of the cyanide, it proved quite expensive and the amount of the sludge formed was objectionable. Sodium hypochlorite was also too costly for this. Tests were then begun in the chemical laboratory on the possibility of destroying the cyanide electrically. It was evident from the beginning that the passage of direct current at high current density would destroy the cyanide, based upon the experience of others.* Laboratory experiments were performed to determine the best operating cycle under our conditions. These consisted of trial runs using combinations of different electrode materials, temperatures, and currents. Steel, both carbon and stainless, showed a very short life as anodes, due to the strong oxidizing conditions present. As cathodes, their life was practically infinite, although deposited metal had to be removed periodically.

The use of lead anodes resulted in a very slow rate of cyanide decomposition as compared to steel. Titanium anodes become polarized in a matter of seconds, with resulting decrease of current through the solution. Both carbon and graphite anodes performed well. Although both were slowly eroded as the chemical and electrical attack loosened the bonding material, no film formed on the anode area to build up an electrical resistance. Anode life was sufficiently long to make this material economical. Also the amount of cyanide destroyed per unit of time and current was more than with the steel anodes. The end result was mild steel cathodes and carbon anodes.

An investigation of alternating current was made in an attempt to decrease the amount of equipment necessary for an industrial installation. Laboratory tests were made, using an auto-transformer to control the current, but very little cyanide was destroyed and this approach was abandoned in favor of direct current, which was used in remaining experiments and in the plant installation.

Like most electrical processes, heat is generated in the bath by the passage of current. This heat, of course, aids in the breakdown of the cyanide radical and complexes and also increases the conductivity of the solution. Through experiments, it was found that 180-200°F. was sufficient to obtain the desired results. The amount of heat generated by electrolysis is naturally dependent on the amount of current and the anode-cathode area in the bath, and must be supplemented with external heat, using steam coils, for example.

After the laboratory trials, it was decided to make a production installation. A mild steel tank of 250 gallon capacity was selected and carbon anodes 1" diameter by 36" long were installed, together with mild steel rods of the same size as cathodes. Two carriers of four cathodes each were mounted with carriers supporting the anodes in such a manner that

*Sperry & Caldwell, "Destruction of Cyanide Copper Solutions by Hot Electrolysis," Plating, April 1949.

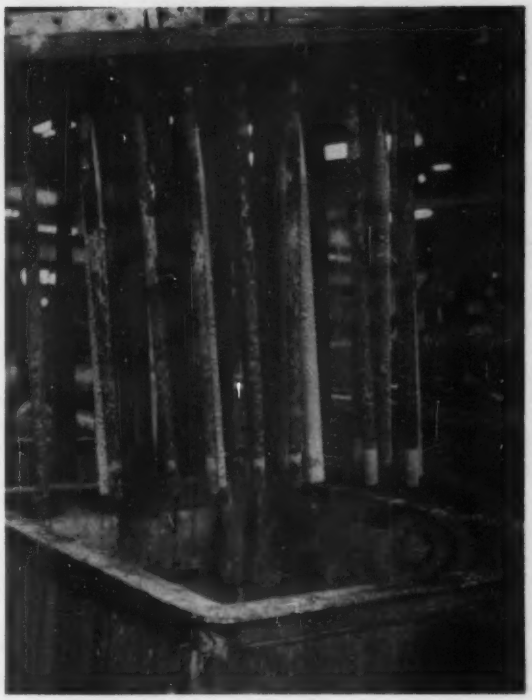


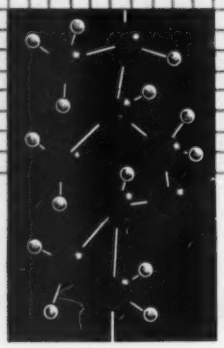
Fig. 2. Electrodes suspended above tank. Note heavy metal deposit on cathodes.

each cathode was surrounded by four anodes. Current was supplied at 900 amperes by an 18 volt, 1000 ampere copper oxide rectifier. The bath temperature was maintained by a steam heated plate coil. This setup performed as expected and was operated as a production unit, although controlled by the chemical laboratory as are all processes in the plating department. Figures 1 and 2 show the anode and cathode arrangements in the destruction tank.

For the electrolytic destruction of mixed cyanides it appears that the more anode area present the faster the process. For our tanks and convenient time element an anode area of four times the cathode area seemed best. By doing this, the anode current density was quite low and prolonged the life of the carbon electrodes.

The free cyanide of the sludge mixture varied from 9,000 to over 30,000 p.p.m. and the total cyanide from 20,000 to 60,000 p.p.m. Time for complete destruction of the cyanide varied, according to the starting concentration, from 24 to 96 hours. When chemical analysis showed the free cyanide to be zero and the total cyanide complexes to be quite low the contents of the tank were emptied into the main effluent stream from the plating department.

These results indicated that a practical shop method was available for destroying these rather annoying accumulations of miscellaneous cyanide residues. For about the past six months it has been effective in quickly getting rid of any sludge accumulations, and it is our conclusion that the total destruction costs are well below the previously used boiling-hypochlorite technique.



SYNTHETIC RESINS

The Backbone of Modern Finishes

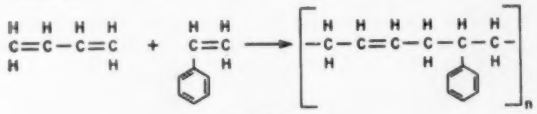
A SURVEY OF THE LATEST DEVELOPMENTS IN SYNTHETIC RESINS USED IN COATINGS

Part VIII - Styrene-Butadiene Copolymers

By Harold P. Preuss

THE large scale development of styrene-butadiene copolymers in the United States commenced during World War II when the supply of natural rubber normally supplied from the Far East was cut off. Prior to that time, American scientists had become familiar with the development of Buna-S in Germany. The establishment of a large industry for the manufacture of "Government Rubber-Styrene" (GR-S) was begun during the early part of the war under the direction of a government agency (Rubber Reserve). The product made had essentially the same composition as the German Buna-S elastomer. The original batch process which commenced operation in 1941 was replaced by a continuous operation early in 1944.

Details concerning the process of manufacture of the butadiene-styrene copolymer are beyond the scope of this article. Suffice it to say that the process has been improved on many times over since these early days. The highly regular, theoretical structure of the styrene-butadiene copolymer, as represented by the following skeleton diagram, however, remains unchanged:



BUTADIENE

STYRENE

STYRENE/BUTADIENE

This resin is a member of the hydrocarbon family of resins, discussed in Part I of this series which appeared in June, 1960.

Styrene-butadiene paint latexes are colloidal dispersions in water of high molecular weight styrene-butadiene copolymer particles. The latex particles are submicroscopic in size. During the film-forming process, water evaporates from the latex dispersion, bringing the latex particles gradually closer to one another. As the particles become more and more tightly packed together, surface tension forces increase and at a certain point the individuality of the particles disappears and a homogenous film structure comes into being. In a pigmented film, the latex particles fuse around the pigment particles and occlude them within the film. Fresh films of styrene-butadiene latex are tough and strong as a result of the initial drying period and they acquire even greater strength and hardness as a result of aging.

Traditional uses for these styrene-butadiene latices have been in the compounding of interior flat-wall paints for use over plaster, concrete block and primed wood trim. Also, they have been used as components in primer sealer type paints and in specialty paints to conceal construction flaws, nail holes, wall cracks, etc.

Within recent years, however, the use of styrene-butadiene latices and resins has been extended to paints used for appliances, metal and automotive primers, drum enamels, and can, pipe, tank, gasket and wire coatings. Price-wise, they are inexpensive and exhibit good electrical resistance, adhesion and a wide compatibility with other resins and modifiers.

Manufacturers of styrene-butadiene copolymers in the United States include those who make the various products used in interior paints as well as those used in metal finishing. Our discussion in this article will be limited to those products in the latter category.

Manufacturers of Styrene-Butadiene Resins

The following firms in the United States make styrene-butadiene resins and latices for use in metal finishing operations: Enjay Chemical Company, Division of Humble Oil and Refining Company, Elizabeth, N. J.; The Goodyear Tire and Rubber Company, Chemical Division, Akron, Ohio; The Borden Chemical Company, New York, N. Y.; The Dow Chemical Company, Midland, Michigan; Firestone Plastics Company, Chemical Division, Pottstown, Penna.; The Koppers Co., Inc., Plastics Division, Monaca, Pa.

Enjay Resins

The Enjay Chemical Company manufactures three types of styrene-butadiene resins for use in finishes

under the trade name *BUTON*. The physical properties of these resins are given in Table I.

Buton 100 is the basic raw material from which the other products called *Buton 200* and *Buton 300* are derived. This product has a low molecular weight (8,000 to 10,000) and high unsaturation (iodine number about 300). It can be considered as a basic resin for further modification with other materials to produce finish coating vehicles.

Buton 200 and 300 are modifications of Buton 100, the basic material. They have been treated to introduce polar groups yielding products having excellent overall mix in compatibility with other coating materials. The solvent system is aromatic with isopropanol added to provide viscosity stability. Buton 300 is the more reactive of the two because of greater polarity. A wide range of particular properties can be obtained by blending Buton 200 and 300 together and with other coating materials. Buton 200 and 300 may be cured in conventional film thickness.

Buton 100, 200 and 300 may be baked or flame cured. In addition, Buton 200 and 300 may be cured by crosslinking with tetrachlorophthalic anhydride or organic phosphates such as ethyl acid phosphate at low temperatures. A limited amount of work in the air dry field suggests modification with other materials; e.g. nitrocellulose additions yield films curable at room temperature.

The flame-curing technique consists of impinging an air-gas flame directly on the surface of the wet resin coating. The solvent flashes off and the polymer is converted to a tough, mar and chemically-resistant film.

This technique can be used to advantage for:

1. Instant curing of coatings, i.e., no lengthy baking cycles. Flame curing is 20-50 times faster than short bake cycles.
2. In place coating of equipment too heavy or bulky to be baked.
3. Continuous unit operation enabling coating, curing, and packaging without interruption of flow of work.

Specifically, this method of cure is applicable for coating wire, pipe and metal of all kinds. From a laboratory viewpoint, a simple method of evaluating flame curing is to spray out panels and cure with a small propane type burner used for soldering. The type of gas used, i.e., propane, butane, acetylene, does not influence cure. Pre-heating the metal results in more rapid solvent flash-off and faster cure.

All three Buton polymers can be flame cured; Buton 200 appears to be the most suitable for this type cure. The addition of 1% H_3PO_4 on polymer solids yields flame-cured films that can be fabricated.

Buton coatings pigmented with TiO_2, red lead and iron oxide, have been successfully flame-cured. Pigmentation has been used to advantage in building up greater film thickness versus clear films and maintaining control on coated versus uncoated areas. The films subjected to flame curing have a tendency to darken with higher temperatures.

Phosphated steel, CMQ (can makers quality) steel,

TABLE I

Properties of Styrene-Butadiene Polymers

Manufacturer	*Resin*	*Physical Form*	*Non-Volatile Content %*	*Solvent*	*Specific Gravity*	*Viscosity Poise*	*Color, Gardner*	*Acid No.*	*pH*
Enjay	Buton 100	Resin	100	—	0.915	0.9-1.2*	1*	0	—
	Buton 200	Resin	50	37½% Solvesso 100 12½% Isopropanol	0.925	1.6-2.5	7	10	—
	Buton 300	Resin	45	33% Xylol 22% Isopropanol	0.913	1.25-1.65	10	16	—
Goodyear	Pliolite S-5	Resin	100	—	1.05	Variety from 3-24	—	—	—
Borden	Polyco XP 24-97	Latex	46±0.5	water	1.01	<5	—	—	3.5-4.5
Dow	566	Latex	46	water	1.01	—	—	—	4.0±0.5
	762-W	Latex	48	water	1.01	—	—	—	10
Firestone	Butaprene PL-30	Latex	48	water	1.01	2.5	—	—	—
Koppers	Dylex KCD-141	Latex	48	water	1.02	4-7	—	—	7.5-8.0

*At 50% NVM in Varsol, viscosity at 100% solids is approximately 3000-3600 poise.

tin plate, copper, lead, aluminum, and asbestos board have been coated with Buton and flame cured.

Flame-cured films can be very carefully handled at 250°F. Above this temperature films are tender. At 140°F., films will withstand rough treatment. A cold water quench results in maximum handling speed.

When Buton resins are used in baking finishes the following points should be observed:

1. When used as the sole vehicle, the resins should be baked at 350°-400°F. to obtain optimum hardness and chemical resistance. Under these conditions, properties are comparable to high quality resins in common use. At these elevated temperatures, there is a definite discoloration which limits use in whites. Acceptable greys and deep tones can be obtained at the higher temperatures.
2. When baked at 275°-325°F., these resins should be formulated with 10-20% urea or melamine resins for optimum properties. For primers and chemically-resistant coating, the slight discoloration observed at this temperature is acceptable; enamel holdout is excellent with no bleed.
3. Buton 300 formulated with tetrachlorophthalic anhydride or ethyl acid phosphate can be baked at low temperatures (200°-250°F.) to obtain films with excellent color and hardness.
4. Air-dry Buton 300 coating can be prepared in combination with ethyl acid phosphate, urea or melamine and nitrocellulose.

Some typical uses of the three Buton resins are exemplified by the following:—

Buton 100	Can coatings
Buton 200	Appliance primer; automotive primer; wire coatings; gloss and flat, grey and black enamels
Buton 300	Wire coatings, high gloss, colored baking enamels.

Goodyear Resin

Pliolite S-5 is the Goodyear Tire and Rubber Company's styrene-butadiene resin which can be formulated into coatings of good adhesion and flexibility for steel and masonry painting, at costs about equal to good alkyd and oil-based paints, but without susceptibility to atmospheric oxidation or saponification.

Types of service range from the general industrial atmosphere to underground and water-immersed service to the severest chemical services involving foods, soaps, solvents, and other chemical agents. The general limitations of all protective coatings in corrosive service apply also to the Pliolite S-5 coatings. Direct immersion in liquids is seldom advisable except for short-term service, and the finishes must be almost mechanically perfect. Lesser degrees of exposure, ranging through intermittent immersion, splash and spill service, concentrated fumes, and finally, light vapor or mist exposure, will result in increased durability in that order.

Clear lacquer-type finishes of Pliolite S-5 have found several good applications for interior uses. The clear finishes should be formulated at a concentration of 25 to 30% resin in a 50:50 solvent mixture of high-flash naphtha and mineral spirits to give a modified Stormer viscosity of 60 to 70 K.U. for good brushing consistency. This can be used on many metals. Aluminum and stainless steel can be treated in the same way. Concrete floors coated with unpigmented resin give a non-staining surface and eliminate cement dusting and abrasion. Areas of heavy wear can be touched-up repeatedly without strong contrast to areas of less wear. The literature reports that underground pipe in a mildly corrosive subsoil has been coated with clear styrene-butadiene lacquer with good results.

Some idea as to the chemical resistance of enamels based on Pliolite S-5 may be gained from Table II. These may be applied by either brush or spray.

In addition to the above applications, Pliolite S-5 has also been used in traffic paints, swimming pool paints, fume resistant enamels, alkali and acid resistant coatings, etc.

Borden Latex

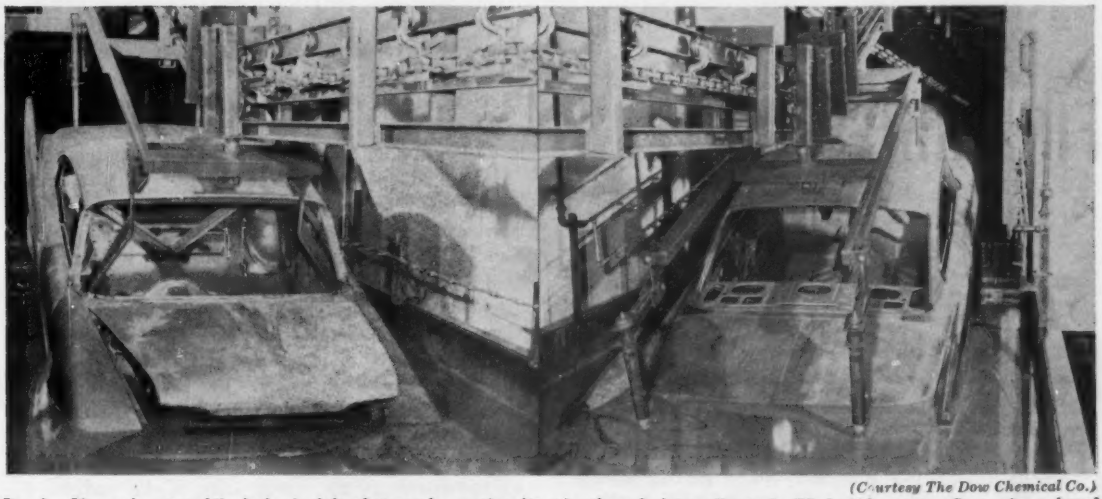
The Borden Chemical Company produces a copolymer of styrene and butadiene known as *Polyco XP 24-97* for use in baking finishes on metal surfaces. The latex forms a film by the customary mechanism of fusion of the particles of resin in the latex, but on baking at elevated temperatures converts to a hard, tough, water and alkali resistant film with good adhesion to most substrates. In the copolymerization of butadiene with styrene, the resulting copolymer still retains one double bond per unit, thus retaining a substantial degree of unsaturation. By means of metallic catalysts and elevated temperatures, cross-linking is produced and the polymer is converted from a soft, slightly tacky, solvent-susceptible material to a dry, tough, solvent-resistant film. The latex

TABLE II

Chemical Resistance Ratings of Pliolite S-5 Enamels

(Ratings: G= Good, F = Fair, P = Poor)

Class of Corrosive	*Rating*
Alcohols	G
Aldehydes	F
Aliphatic Solvents	F
Alkalies	G
Aromatic Solvents	P
Brewing Process Liquids	G
Detergents	G
Esters	P
Ethers	P
Fresh Water	G
Glycerine	G
Glycols	G
Grease	G
Halogenated Solvents	P
Ketones	P
Milk & Dairy Products	G
Mineral Acids	G
Nitroparaffins	P
Oils	F
Organic Acids	G
Salts	G
Sea Water (Immersed)	F
Soap	G



(Courtesy The Dow Chemical Co.)

Fig. 1. Plymouth automobile body, in left photograph, starting its trip through large dip tank filled with rustproofing primer based on styrene-butadiene latex. Photograph at right shows the body emerging from the dip tank.

lends itself readily to the formulation of metal primers and gloss finish coats, both for dip and spray application. Any conventional spray gun may be used for spray application.

Dow Latices

Two latex type styrene-butadiene copolymers are made by The Dow Chemical Company for use in formulating paints for industrial applications. The copolymers are known as *Latices 566* and *762-W*. Their properties are shown in Table I.

Both of these products are colloidal dispersions of high molecular weight styrene-butadiene copolymer particles in water. Hence, hazards to personnel and plant from solvent toxicity and flammability are reduced to a minimum. Particularly important, these latices permit the formulator to manufacture high solids content paints, with tough high molecular weight copolymer particles, resulting in high film build per coating application. Other characteristics include excellent mechanical stability, excellent pigment binding properties, and excellent pH stability. The latex film provides good adhesion, alkali resistance, water resistance, and toughness.

This is a general correlation which holds true for many typical latex polymers such as styrene-butadiene. As average molecular weight increases, there is usually a corresponding increase in desirable properties, i.e. per cent elongation, tensile strength, and impact resistance. With latex systems, these high molecular weight property achievements are attainable even at water-thin viscosity. A decided advantage to the paint user is the possibility of obtaining a given industrial finish in any viscosity from thin to thick, allowing him to choose a viscosity best suited to his method of application.

The air-dry latex paints formulated with Latex 762-W provide a tough, strong, elastic paint film with good adhesion as a result of the initial drying period, and they acquire even greater strength and hardness as a result of aging.

The baked industrial latex paints formulated with Latex 566 employ heat and driers to take maximum advantage of the reactive butadiene groups in the copolymer. This promotes a thermosetting phenomenon in the latex paint film and results in a remarkable upgrading of film properties. When applied to metal, dried, and baked, paint films with Latex 566 are characterized by exceptional adhesion, toughness, and hardness and good water, chemical, and mineral spirits resistance. In formulating with Latex 566, driers are added which cause cross-linking between copolymer chains during the baking cycle. The copolymer is thus converted from a soft, thermoplastic material to a hard, resistant, thermoset higher polymer film.

Industrial latex paints based upon Latex 566 or Latex 762-W can be applied by any of the conventional means. This includes spraying, roller coating, dipping, and flow coating. These paints can also be applied by the air atomization electrostatic spray process and by the spinning disc electrostatic spray process.

The properties of Latices 566 and 762-W make them suitable for use in many types of finishes for metal. They can be used in primers and in gloss and semi-gloss paints. However, the color developed in the baking process or that color contributed by resin modifiers limits their use to darker colors. Gloss and semi-gloss paints become hazy with long term exterior exposure and are therefore generally undesirable for exterior applications; however, film integrity remains good. Some suggested end uses are listed below:

Primers
- Automotive parts and body
- Metal furniture
- Electrical equipment-motors, transformers, etc.
- Refrigerators, air conditioners, stove parts, etc.

Gloss and Semi-Gloss Paints
- Metal furniture
- Motor enamels
- Drum enamels
- Tank car linings (caustic resistant)
- Small parts

(*Continued on page* 65)

FINISHING POINTERS

Plating Chemicals

By J. B. Mohler
Consultant, Seattle, Wash.

THE experienced plater has little difficulty with the purity or composition of common plating chemicals. These chemicals are of commercial quality, manufactured to a consistent form. Large scale chemical production enables good control of the purity and the composition. Also, the plating literature is consistent in referring to chemicals. Copper sulfate for instance is $CuSO_4 \cdot 5H_2O$. On the other hand, this is so well known that it is not always made clear. This disregard of clarity is common in the chemical industry. "Copper sulfate" is chemical shorthand for copper sulfate pentahydrate or blue vitriol ($CuSO_4 \cdot 5H_2O$). Copper sulfate also can be $CuSO_4$ or anhydrous copper sulfate. All this not only can be but, at times, is confusing.

If there is any doubt about a chemical, a check should be made. A chemical handbook will list the forms and properties of known chemicals. Unfortunately, many of these are not commercial forms. Chemical catalogues or a special reference book are better. "Chemicals of Commerce" is a good reference source. However, even here there is some difficulty. Single nickel salt[1] is described as the "heptahydrate, $NiSO_4 \cdot 7H_2O$" whereas there is no doubt, at least for plating purposes, that single nickel salt is $NiSO_4 \cdot 6H_2O$.[2]

There is little trouble in establishing the chemical formula of a plating grade compound, although great care should be taken that the understanding is clear. An error at this stage, on paper, could make the difference between success or failure of the process.

A good example, where a check should be made, can be taken from the recognized authoritative source of Blum and Hogaboom.[3] Here, a table is given on the specific gravities of "copper sulphate plus sulphuric acid." This is a useful control table and it just happens that the gravities of copper sulfate and sulfuric acid are almost identical at the same concentrations. One cannot help but wonder if the fortunate circumstance of nature occurs for $CuSO_4$ or $CuSO_4 \cdot 5H_2O$. It happens to be $CuSO_4 \cdot 5H_2O$, consistent with the common plating chemical, therefore, absence of clarity presumably is excusable. Nevertheless, this is a case where one should be doubly sure before constructing a control chart or graph.

In general, it is good practice to check commercial chemicals against the plating grade chemicals.[4] Chemicals may be recommended from materials used in the original laboratory work that are not consistent with the commercial forms. Thus, original work could be done with cobalt sulfate monohydrate ($CoSO_4 \cdot H_2O$) whereas, the commercial form is heptahydrate ($CoSO_4 \cdot 7H_2O$). Notice that the hydrates are neither consistent nor is a single form produced; although one of each chemical is the common commercial form.

Hydrated chemicals are the natural crystallization products of the chemical. They are thus the form most easily produced. Also, the hydrates are easy to handle since they are readily soluble in water and free from dust. On exposure to air hydrates dry out (depending on the vapor pressure of the hydrate). Copper sulfate crystals, $CuSO_4 \cdot 5H_2O$, for instance, effloresce to a pale blue powder of $CuSO_4 \cdot 3H_2O$. Therefore, one should not assume the exact formula of a hydrate, particularly if the chemical has been exposed to the air over a period of time.

The chemical content of acids and alkalies is not as consistent as the metal salts. Flake sodium hydroxide is 98% NaOH, and sodium cyanide is 96 to 98% NaCN. Thus, the chemical formula can be assumed for technical purposes. Sodium silicate is a term that is applied to a number of compounds. The more alkaline silicates are used in various metal cleaning formulations. Sodium orthosilicate, the most alkaline of the silicates, used as a heavy duty metal cleaner, corresponds to the formula Na_4SiO_4. Sodium metasilicate is used similarly, along with other alkalies. It exists as several hydrates, either $Na_2SiO_3 \cdot 5H_2O$ or $Na_2SiO_3 \cdot 6H_2O$. "Water glass" is an indefinite term covering solutions of sodium silicate. The solutions are sold on the basis of gravity and Na_2O:SiO_2 ratio. Water glass is not extensively used in electroplating but, if it is used, the grade should be specified in terms of total concentration and chemical ratio.

Sulfuric acid is referred to as "sulfuric acid" or "concentrated sulfuric acid." The grade should be specified. The commercial grades are 60°Bé and 66°Bé. The former is 78% H_2SO_4, containing about 11 pounds per gallon of H_2SO_4. The latter is 94% H_2SO_4, containing 14 pounds per gallon of H_2SO_4.

Nitric acid is available in a number of concentrations as follows:

°Be'	% HNO_3	HNO_3 lb./gal.
36	52.3	5.9
38	56.5	6.5
40	61.4	7.1
42	67.2	8.0

Phosphoric acid is available in 50 and 75% H_3PO_4 grades, and 85% H_3PO_4 grade at a premium price.

Chemical manufacturers produce recognized commercial grades of chemicals to guaranteed minimum analyses. If there is any doubt the supplier should be contacted. He will be glad to describe the grade and minimum chemical content of any commercial chemical.

References

1. "Chemicals of Commerce," F. D. Snell and C. T. Snell, First Ed., p. 91, 1939.
2. Metal Finishing Guidebook, 1958 Ed., p. 596.
3. "Principles of Electroplating and Electroforming," Blum and Hogaboom, 3rd Ed., p. 433, 1949.
4. "Dictionary of Metal Finishing Chemicals," Hall and Hogaboom.

Factory Color Coating for Prefab Buildings

By Haviland F. Reves

THE recent installation of a modern specially-designed line for application of colored coatings to galvanized steel panels has opened a great and fast-growing new market in the construction industry. With these mass production facilities, the cost of color application is only about 16 to 20 per cent of the normal cost of painting on the job.

The installation has actually been operating under production conditions for about three years at the Terre Haute, Ind., plant of Stran-Steel Division of National Steel Corporation. This company has been widely known for its famed Quonset buildings, no longer in production. When this market tapered to an end, the company sought a means to establish a position of leadership in the rigid frame prefabricated building market. Forward thinking along the line of factory-applied color had been under way for at least seven years. But this new development in mass-production finishing unlocked a potentially vast new market. The Terre Haute plant now has over 500,000 square feet of space for production of such building components, with efficient new electronic equipment for production and inventory control.

Sales of pre-engineered steel building components have increased at a 25 per cent annual rate for the past three years, for the entire industry. The 1960 steel sales at mill-level prices for this market were over $250 million; for 1970 they are projected to be $1 billion.

The distinctive characteristic of this company's panels is the rib-type construction — which presents some special problems in color-coating. Today, using principles of interchangeability of parts, the company offers a line of over 350 buildings to its customers — compared to 65 in the former line — and requiring actually fewer major components.

Along with the attractiveness of a line offering a generous color selection, this firm has introduced new design concepts into steel building construction. Research was made into customer preferences, in design and color. Major developments of the project resulted in attractive new building fronts, the use of appropriate ornamental treatment to eliminate the familiar "sheet metal look," and the development of a new type window especially adapted for easy installation in a steel building. All this has made the use of steel construction appealing to architects, who have generally found it of little aesthetic interest.

Appearance is probably the most obvious of the several factors which have led to the opening of this new market, based upon new developments in finishing. Variety in color, including patterns of alternating colors, has made steel a potential competitor with other modern building materials in areas where it was formerly not even considered.

Cost advantage is a second major factor. Prefabricated construction in itself has a general economy of about 25 per cent or more over conventional construction. (Fig. 1.) Color-coating at the factory offers a significant additional saving, with the cost

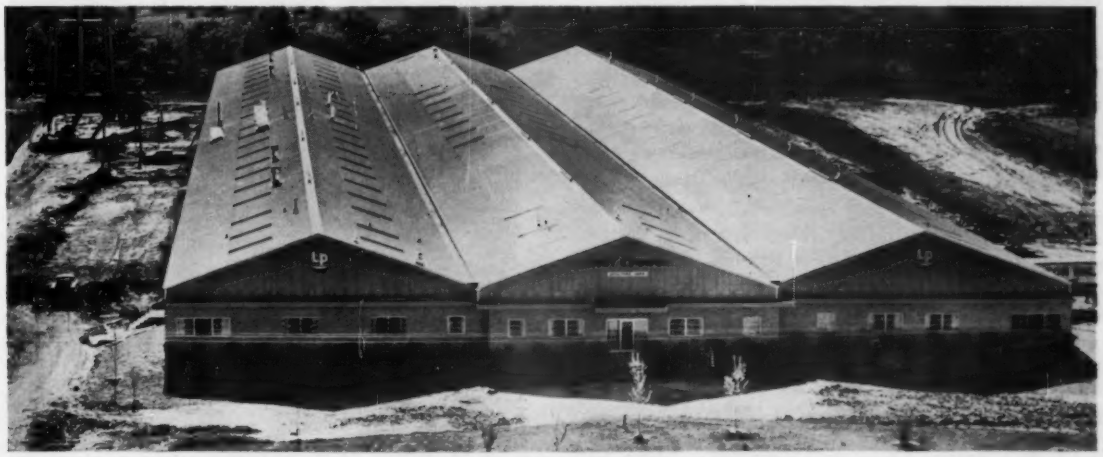


Fig. 1. This 112,000 square foot structure houses the Light & Power Utilities Corp. at Olive Branch, Miss. Because the building was constructed using colors applied at the factory, the company saved $12,000 in on-the-job painting costs. Moreover, the building was erected in just 100 working days, or about half the time that would have been required for conventional construction.

running approximately two cents per square foot of panel additional, compared to non-coated panels. Customary practice has been to paint such buildings on the site, either before or after erection — at a cost averaging 10 to 12 cents per square foot.

From a production standpoint, the most important difference may be considered to be improvement over the fomer system in quality of the ultimate finish, for two reasons: (1) When a coating is field applied workers must frequently walk on a previous coating to apply a subsequent coating; (2) A paint job applied outdoors picks up a great deal of foreign matter before it becomes dry.

The quality of the finish as applied is a major technological advantage of the new process. The surface of the panels in the untreated state is essentially similar to the galvanized surface of rain gutters used in residential construction. Conventional painting of such surfaces, exposed outdoors, inevitably results in peeling in a very short time — usually in a matter of days.

The new finishes have been subjected to accelerated tests, including exposure on the roof of the office buildings at the steel mill in Detroit. Such accelerated tests show a life expectation of 10 to 15 years with very slight deterioration; under good weather contions, 20 years of life may be expected. In fact, the metallic colors tend to brighten with age.

Another important new technical development lies in the bonding agent or primer, which creates the adhesion qualities necessary to provide satisfactory adhesion, over a normal period of years of use.

Color-Coating Line

Forming the Sheets

The 600 foot long color-coating line has a capacity to turn out over 1,000,000 lineal feet of color-coated panels per week.

Steel is received in 10-ton coils, 41½ inches wide, 26 gauge galvanized, ASTM specification A-93, with a nominal zinc coating weight of 1.25 ounces per square foot. Material as it comes from the mill is essentially ready to use, and does not require degreasing and similar preparatory stages.

Coils are loaded on an uncoiler which feeds a continuous strip onto a motorized belt conveyor, which delivers it to the point for threading for entry into the roll forming mill. Because the forming and coating processes are closely integrated, some understanding of the fabrication procedure is essential.

This mill has 15 forming stands, each of which progressively shapes the continuously-moving steel strip into the characteristic ribbed-type panel design, as used for pre-engineered steel building roofing and siding coverage. The steel is fabricated down to a 38-inch width, with 6½ such ribs across the panel width — the outer fractional rib being used to overlap in field application. This 38-inch width gives a three-foot wide coverage to the panel as installed in the field, overlapping 2 inches.

The galvanized strip receives a wire brush cleaning as it leaves the fifteenth stage of the roll forming mill, to dispose of any possible zinc flaking occurring during the roll forming. This is performed by: (1) a series of straight wire brushes mounted above, impinging upon the radii of the formed ribs in the strip, and (2) a series of power-driven steel brushes on the under side. The upper side of the strip is the weather side, which is to be coated. The conveyor moves the material at this stage at a speed of 95 feet per minute.

Just as the strip leaves the roll forming mill, following the wire brushing, it is cut into desired panel lengths by a slug-type flying shear. In practice, lengths are from about four to 35 feet, the latter giving a ground-level-to-eaves panel for virtually any building. The theoretical maximum for a panel length is 100 feet, but this is too difficult to handle in practice.

One-half inch of steel is removed at each shear application, in order to leave clean edges, both leading and trailing. The cutting dimension is controlled by an adjustable cut-to-length gauge, located behind the flying shear.

The panels, now cut to length, are automatically transferred by the run-out conveyor from the roll forming equipment, onto a pin type conveyor. This unit is operated at 105 feet per minute, so that the interval between panels will be slightly increased, rather than having them closely spaced together, as the conveyor takes them into the bond coating booth.

The Bonding Operation

The bond application is considered the keystone of the whole process, being the agent which assures adhesion of the finish coat to the galvanized metal surface. It is described as a high molecular weight vinyl-acetal resin, combined with active compounds such as phosphoric acid, chromates, and alcohols. It functions as a combination metal treatment and primer, which simultaneously phosphates the metal and deposits a corrosion-inhibiting primer type con-

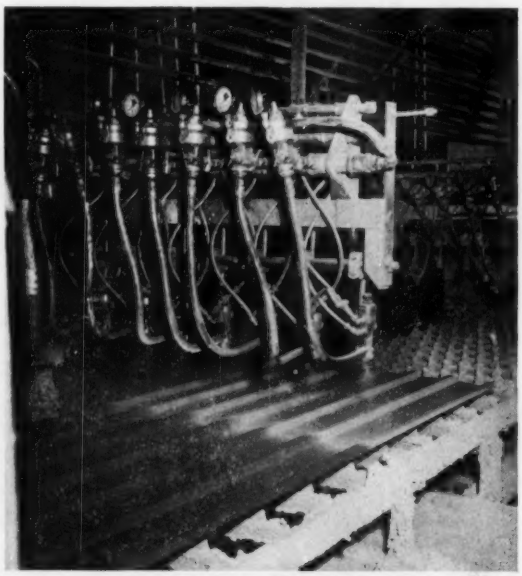


Fig. 2. Panels being sprayed inside finish color coating booth. The first two coats are applied by guns which spray across the panel in a straight line. There are seven guns on each spray arm.

Fig. 3. Pre-fabricated window hanging from magnetic hooks on flashings and windows coating line.

tinuous film, chemically reacted with and bonded to the zinc-coated metal. This coat has a minimum dry film thickness of 0.3 mil.

In the bond coating booth, a battery of five stationary spray guns is directed straight down, operating in a straight-line arrangement to completely cover the width of the panel.

These spray guns are controlled by a memory-timer. This unit automatically memorizes the length of each panel as it passes over a micro-trip signal. This signal setup actuates the spray guns, just as the panel is ready to move under them, and stops spraying when the panel moves out of target range.

The bonding coat material is tinted yellow to facilitate inspection procedure, as it would otherwise be colorless and virtually invisible.

At the exit end of the bond spray booth, the panels pass through a short enclosure equipped with a 4,000 cfm fan. This large capacity fan arrests fumes from the oncoming panels, blowing the fumes back into the bonding booth, where they are suitably exhausted.

The panels, still traveling at 105 feet per minute, next enter a 20 foot oven for bond coat curing at 300-350°F. The heat source is an indirect-gas-fired 600,000 Btu burner. Slight remaining fumes from the bond coat are then removed as the panels pass under another 4,000 cfm fan, which also serves to cool the material for manual handling at the transfer point.

To this point, panels have traveled over about 240 feet of the line. From the fan, they move on a motorized belt runoff conveyor to the transfer aisle at the end of the bond coating operations, and are conveyed across the aisle on a transfer buggy, for the start of the finish coating operations. This line, 360 feet long, parallels the bond coat line, running in the opposite direction.

Two men place the bond-coated panels on a motorized conveyor operating at 80 feet per minute, on which they first pass directly under an air-manifold spray, which remove any possible dust particles from the surface.

At this point panels move into a 12 foot preheat oven. The heat source is three banks of quartz tubes rated at 72 kw. This oven is designed to maintain uniform temperatures of 100-125°F. regardless of outside conditions.

The Finishing Operation

The panels are next transferred to a flight type conveyor, and enter the first color coating booth. The panels pass under two sets of spray guns successively, so that each set gives one of the first two color coats. (There are three finish coats in all.) Each set consists of seven guns arranged in a straight line at right angles to the line of travel of the material. (Fig. 2.)

Actually, each spray location has two sets of guns (i.e., 28 guns in all). The second set at each station is held available to be swung into operating position quickly to make a fast color change. This is prepared for use as needed while the other two sets are applying the first and second finish coats.

The second sets of guns are cleaned and ready for use while the first sets are in use. When the second sets are swung into position, by moving the arms on which the batteries of guns are mounted, the first sets are swung free of the line. They then become available for cleaning and preparation for the next color change. The average time required for a color changeover with this installation is only three minutes.

The guns in this finish coat booth are controlled, like those in the bond coat operation, by a memory-timer, which automatically memorizes and remembers the length of the panels, which serves as the key to control of the spray.

As the panels leave this booth after the second finish coat, they travel through only three feet of open space between booths, to enter a 16 foot booth for the third finish coat. This houses a carousel type spray unit with eight spray guns.

The carousel revolves at 40 rpm. Each of the eight guns is operated individually by a memory-timer, which automatically remembers both the length and the width of the panels coming through. Each gun is actuated by a separate micro-trip signal, with the series of guns going on and off progressively. By this control, the guns spray only on actual panel surfaces as they pass through.

This high speed rotary spray installation is able to do an impressive job of color coating the 13 flange sides of the rib-type panel, so that film thickness is adequate on these sides as well. Coatings are inspected to assure a minimum thickness of 1.25 mils, on both the main surfaces and the flange sides.

At the exit end of the spray booth, another 4,000 cfm fan arrests fumes, blowing them back into the carousel booth. At this point, the panels are automatically transferred from the pin type conveyor to another flight type conveyor, which carries them through a 140 foot multi-zone oven installation.

The Baking Operation

The oven system has four zones. Zone 1 has a

600,000 Btu gas burner and three banks of 2,000 watt infrared tubes with a rating of 36 kw. Each of zones 2, 3, and 4 includes a 300,000 Btu gas burner and two banks of 2,000 watt infrared tubes, with a rating of 12 kw. In all four zones, air movement is at 3,500 cfm.

The temperature in zone 1 is maintained at approximately 275°F. This temperature is related to the wetness of the coating on the panel.

As the material leaves zone 1, the coating is much drier and is beginning to assume the film state. Because of this latter condition, the material must be dried from the bottom out. The control in zone 2 is accordingly set at about 175 degrees, and never allowed to exceed 200. The temperature at this stage must be kept below the latter point, to prevent blistering of the coating.

This process of drying from the bottom out is completed in zone 2, and the control temperatures in the subsequent stages are accordingly raised — to 250°F. in zone 3 and to 300°F. in zone 4.

As panels leave the fourth zone of the oven installation, they receive a water quench of city water at normal temperature from four atomizing guns. This fine atomized water spray is rapidly flashed off by the heat of the panel itself, which was of course 300°F. at the point of exit from the oven.

The panels next travel through a 50 foot cooling section, which brings them to near room temperature. This is accomplished by a series of six 36 inch fans, each rated at 12,000 cfm and operated at relatively slow speeds.

Moving out of the cooling section, the panels are finally automatically transferred to a gravity type conveyor (from the flight type conveyor), which moves them out for unloading at the end of the line.

Quality Control Tests

The quality of the finish is subjected to a series of performance and physical tests including:

1. Film thickness of pretreatment and finish coats is measured. The combined thickness must be in the range 1.25-1.5 mils, with the former as a minimum at any point.

2. Adhesion is tested by attempting to peel the coating back from the end of a strip cut ¼ inch wide. If any coating can be peeled back, adhesion is considered unsatisfactory.

3. Color is evaluated by a color difference meter and also visually by a group of qualified color matchers, with the opinion of the latter prevailing in case of disagreement. Appearance must be free of mottling, wrinkling, orange peel, runs, sags, dry spray, and craters.

4. On the non-metallic coatings, average specular gloss rating 15-20, Federal Test Method Standard 141, Method 6101, is required. Metallic coatings are given a matte finish.

5. Bundles of coated sheets are tested for detrimental blocking up to six months after coating. This is defined as any sticking together sufficient to pull paint off the substrate or the pretreatment, or to pull the paint film apart.

6. Panels are given 500 hours salt spray exposure, under ASTM method B-117-57T. The cut is made through the substrate, but not through the zinc to basis metal. Panels must show a maximum of ⅛ inch loss of adhesion due to zinc oxidation or blistering from the score mark.

7. Panels are immersed for two weeks in water, under ASTM method D870-54, and given a two hour recovery period. They must then show adhesion of pre-immersion standards, no softening, and no surface whitening.

8. Panels are given 500 hours exposure in an Atlas Weatherometer, ASTM Method E-42-57T. Checking and cracking are tested by polishing a one inch strip with automotive cleaning compound to remove dirt and chalk. Mild chalking is permissible, but there must be no serious erosion, no rusting, and no appreciable color change.

9. Humidity is tested for 500 hours at 105-110°F. and 95-100% relative humidity, Federal Test Method Standard 141, Method 6201. There must be no blistering or loss of adhesion after a two hour recovery period.

10. Panels must show no loss of adhesion or cracking of the coating, under a magnifying glass, following the flexibility test. This subjects a standard annealed galvanized panel to a bend of 180°, under Federal Test Method Standard 141, Method 6222.

11. Abrasion resistance is tested by Federal Test Method Standard 141, Method 6192, using CS-10 wheels. Nonmetallic coatings may not show a wear index above 100, while metallic coatings may not exceed 75. The procedure specifies that the wheel pressure against the film tested shall be 1,000 grams, for 500 wear cycles.

12. Panels were tested for one year under typical atmospheric conditions of use, facing at 45 degrees to the south, following an X cut through the coating system only. They are required to show no corrosion of the substrate, and no loss of adhesion or film failure except very minor color changes. Any loss of adhesion due to zinc oxidation or blistering extending from the cuts must not extend over ⅛ inch.

13. The panels are tested for fire hazard with a maximum flame spread rating allowed of 5-10, under Underwriters' Laboratories, Inc., report R-3999.

In this connection it should be noted that the finish coats are of the vinyl chloride-acetate copolymer type. The white, yellow and orange have nonmetallic pigmentation, and are used primarily for accent-color decorative purposes. The other six colors — two greens, two blues and two grays — have metallized pigmentation.

Coatings Line for Flashings and Windows

The basic coating system described serves the panels used in buildings — but does not handle windows and decorative parts, which continued to be painted in the field. To extend the advantages of factory-coating to all components, a separate coating line for such parts started operation a few months ago. This line is distinct from the electronically-controlled panel line in being characterized by flexibility in control.

This separate flashings and window coatings line is about 700 feet long, using an overhead monorail

type conveyor, elevated to a height of seven feet for loading and unloading convenience. Installation of this line is related to the actual production of the company's newly designed window.

The monorail is equipped with magnetic hanging tools exerting a 40 pound pull. This device permits the conveyor to handle all the various shapes, sizes, and weights of parts involved, and eliminates the alternative necessity of having a large variety of hooks available. (Fig. 3.) Parts are manually placed on magnetic hooks.

The conveyor then moves the parts into a 50 foot two stage washer system. The first section is a seven foot enclosure housing an exhaust fan. The next section, ten feet long, houses a spray cleaner unit with pressure nozzles on one foot centers, which operate at 30 psi pressure on both sides of the suspended material. The bath temperature is 160°F. The tank is heated by a 1,000,000 Btu gas-fired burner.

As a 16 foot drain board accumulates the cleaner solution and drains it back into the tank, the material moves into the second stage, which consists of a hot rinse at 140-160°F., housed in a ten foot section. This temperature has been determined as necessary for proper rinsing of material, and as an effective aid to drying after material leaves the washer.

As the material leaves the second stage, it passes through another seven foot enclosure housing an exhaust fan.

It then moves into a large multi-purpose drying oven which will eventually serve to bake both the bond and the color coatings, as well as drying after cleaning.

Leaving the oven's drying-after-cleaning phase, the material now moves into the bond coat booth where application is by hand spray. The material next travels through the 14 foot water wash booth, and moves again into the multi-purpose drying oven for a four minute bake period at 280°F., maintained by a 2,000,000 Btu gas-fired burner.

Leaving the drying oven this time, the material moves into another 14 foot booth for application of the first color coating finish, which is followed by a three minute flashoff period. Then the material moves into still another 14 foot booth for hand spray application of the final color coating. Again, the parts return to the oven, this time for a 10 minute bake at 280°F.

The conveyor speed used on this line may vary from 10 to 30 feet per minute, according to the requirements for cleaning of the various parts being run through. Windows, for instance, require the use of drawing compounds and a longer time in the two-stage washer.

SYNTHETIC RESINS

(*Continued from page* 59)

FIRESTONE LATEX

Butaprene PL-30 is the name of the styrene-butadiene latex made by the Firestone Plastics Company for use on metal substrates. The latex has excellent adhesion to metals, especially steel, and is easily formulated in primer coating applications which can be applied to phosphated or plain steel surfaces. Elimination of surface oils and dirt may be a more critical requirement in this application.

The inherent stability of Butaprene PL-30 permits all types of application such as

1. Brush
2. Spray
3. Dip
4. Roll coat

each of which has a different viscosity requirement.

Butaprene PL-30 may be formulated for "air-dried" or "bake" operation. Formulations of this resin will achieve optimum properties at 350°F. in 15-20 minutes. Although there is some discoloration occurring, this should not be objectionable in a primer. Coatings should be air-dried or force-dried a few minutes before placing in the heat to prevent blistering as water leaves the film.

KOPPERS LATEX

The Plastics Division of the Koppers Company produces a styrene-butadiene latex called *Dylex KCD-141* for use in baking finishes on metal. This material is recommended for use in water-based systems for dip tanks and similar operations. The latex may be modified with other resins either through emulsification of the resin or through other water-soluble types to produce the desired finish. This fortified resin will produce water-insensitive films if a metallic drier is added to the paint system. However, if water insensitivity is not important, excellent solvent resistance and impact strength may be obtained without driers.

Summary

The use of styrene-butadiene resins and latices in industrial finishing operations is relatively new. Several prominent automobile manufacturers dip-coat their car bodies in special primers based on styrene-butadiene latices to give rust and corrosion resistance (Fig. 1). An unusual use for air-dry styrene-butadiene industrial latex paint is the dip-coating of box-springs and mattress springs. Safety considerations play an important role in both these cases, since water is the solvent.

Solvent solutions of the styrene-butadiene resin find use in formulating non-toxic coatings for use in the food industry. An interesting feature of solvent type coatings based on these paints is that opened cans are not subject to skinning over, nor to hard settling on storage.

The styrene molecule is found in a number of polymers used in the paint industry. In our next article we will discuss coatings based on polystyrene, noted for its desirable electrical properties.

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1. Polymers and Resins. By Brage Golding. D. Van Nostrand Co., Inc., Princeton, New Jersey. 1959.
2. Literature supplied through the courtesy of the firms listed in this article.

Chrome Plating High-Loaded Components

By Larissa Domnikov, *Process Analyst A, Norair Division, Northrop Corporation*

CHROMIUM plating is used in many applications: for decorative purposes, for corrosion protection and high wear resistance of parts, and for salvaging of undersized components. The latter application is widely used in the mining industry. Along with the components not subject to high loads in service, parts subjected to high cyclic loads are also being salvaged by building them back to the required size with electrolytic chromium deposits, sometimes of appreciable thicknesses.

However, the electrodeposited chromium decreases the fatigue life and the corrosion-fatigue resistance of parts. This fact imposes limitations on the use of the process for components to be subjected to high cyclic loads in service. One of the major reasons for the reduction of the fatigue life is the residual tensile stress in the chromium deposit, and the greater the stress the greater is the reduction in the fatigue life of parts.

Extensive studies have been conducted by Russian researchers to find methods of minimizing the effects of electrodeposited chromium on the corrosion-fatigue resistance and to find ways of surface strengthening of machine components.[1,2] One of the latest reports on this subject was published in the Russian publication *Metal Science and Treatment*.[3]

At the N.S. Khrushchev plant in Rutchensk, a series of experiments was conducted for the purpose of testing a well known method[1] of mechanical surface strengthening of parts with the use of rollers prior to chromium plating.

The following types of steel were tested:

Chemical Composition of Steel (%)

Steel	C	Mn	Si	Cr	Ni	P	S
45	0.47	0.30	0.20	—	—	0.040	0.030
45CrNi	0.43	0.63	0.30	0.71	1.28	0.022	0.030

Three groups of test specimens were prepared from each type of steel, each group consisting of seven specimens. The first group of specimens, 9.48 mm in diameter, did not receive chromium plating and was tested without the preliminary strengthening. The second group of specimens, 9.28 mm in diameter, was cleaned and plated with 0.1 mm deposit of chromium. The third group was cleaned and chromium plated, the same as the second group, but, prior to plating, was rolled with the use of rollers (the contour radius of the rollers was 2 mm, the pressure was 500 kg.). Testing was conducted on the basis of 10 million cycles. Table 1 shows the test results.

These test results indicate that chromium plating significantly reduces the fatigue life of steel sample. The surface work-hardening with the use of rollers increased the fatigue resistance of these samples considerably.

(*Continued on page 73*)

TABLE 1
Test Results

Steel	Fatigue resistance of non-plated specimens		Fatigue resistance of chromium plated specimens		Fatigue resistance of specimens rolled with rollers prior chromium plating	
	kg/mm²	%	kg/mm²	%, as compared to non-plated	kg/mm²	%, as compared to non-plated
08	23	100	12	52.3	26	113
45	24	100	12	50	24	100
45 CrNi	35	100	21	60	28	80

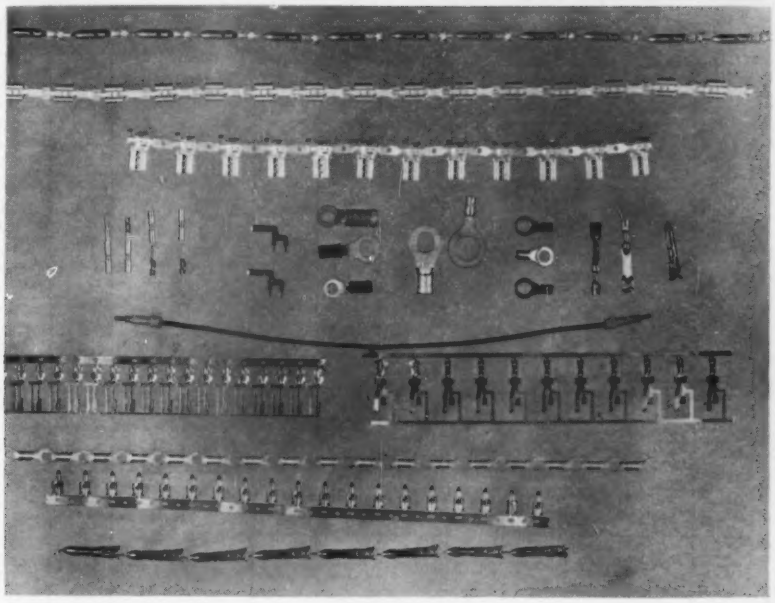


Fig. 1

Measuring Plating Thickness

Industrial Applications of X-Ray Methods

By R. H. Zimmerman, *Associate Research Engineer, AMP Inc., Harrisburg, Penna.*

Richard H. Zimmerman is an associate research engineer working in the field of X-Ray diffraction and fluorescence analysis. He received a B.S. in Chemistry from Lebanon Valley College in 1951 and has been associated with AMP Inc., Research Division, since 1952. He is a member of the American Chemical Society and the Society of Applied Spectroscopy.

RECENT technological advances are placing critical requirements on the manufacture of component parts. Temperature limits and reliability factors have been extended. The use of precious metals for plating materials is commonplace because of their freedom from oxides and good corrosion resistance. The accurate measurement of plating thickness is a necessity not only for cost purposes, but also because there is evidence that it effects other properties such as porosity, corrosion, wear, and electrical characteristics. X-ray methods, which are non-destructive, rapid, and accurate, are ideal for studying thickness and its effect on other properties.

One of the earliest methods for thickness measurement involved the absorption of a substrate diffraction peak.[1] With the growth of X-ray emission analysis techniques, this newer method was applied to tin plate on steel[2,3] and, since then, has been used in an automatic control device.[3] Various modifications of emission methods include selected excitation,[3] selected filtration,[4] crystal reflection absorption,[5] and emission,[6,7] electron probe methods,[8] and radioactive source excitation.[9]

For the past six years our laboratory has used X-ray methods for thickness measurements. Being a manufacturer of small, odd sized and shaped electrical components (Fig. 1) we have had to develop techniques to handle this type of sample. The following discussion is a brief review of this work utilizing both the General Electric and Phillips Spectrographs.

The methods used in this paper include the plating

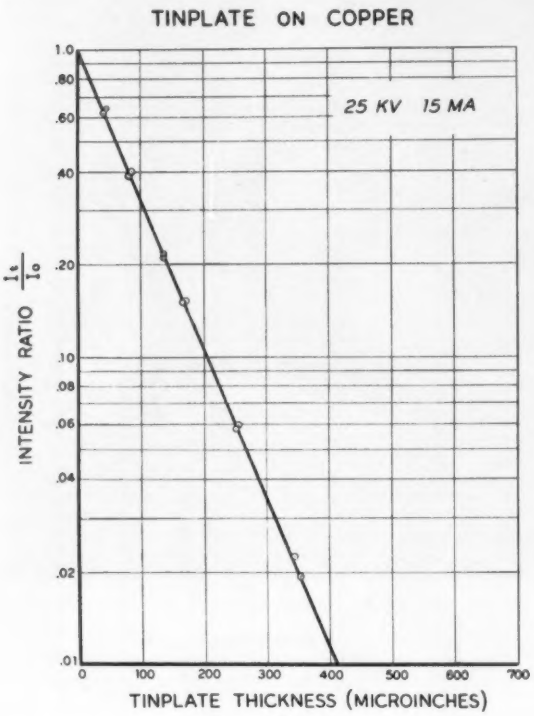


FIG. 2

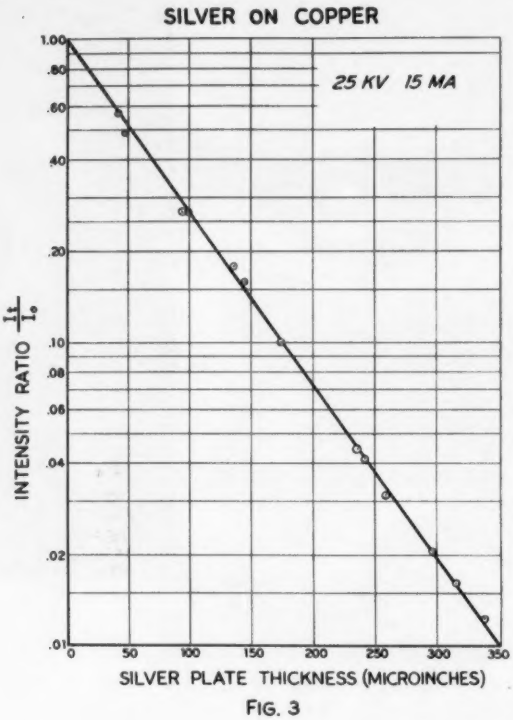


FIG. 3

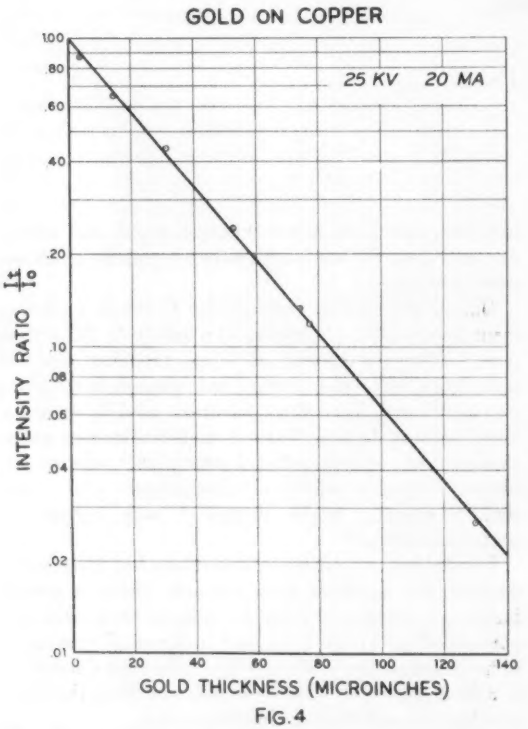


FIG. 4

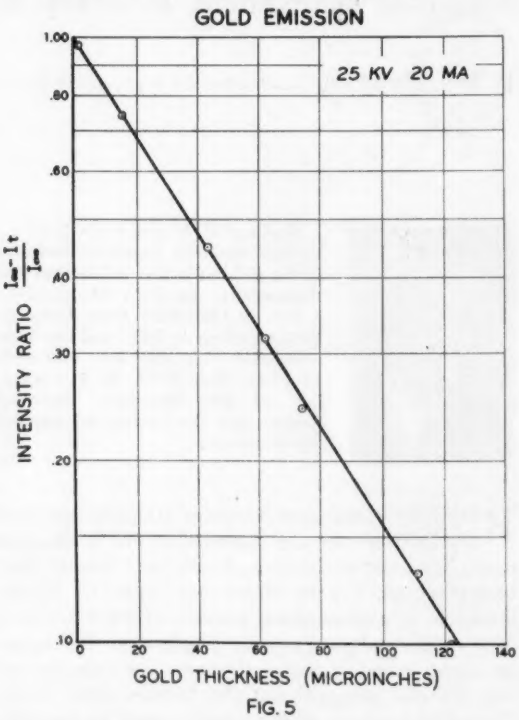


FIG. 5

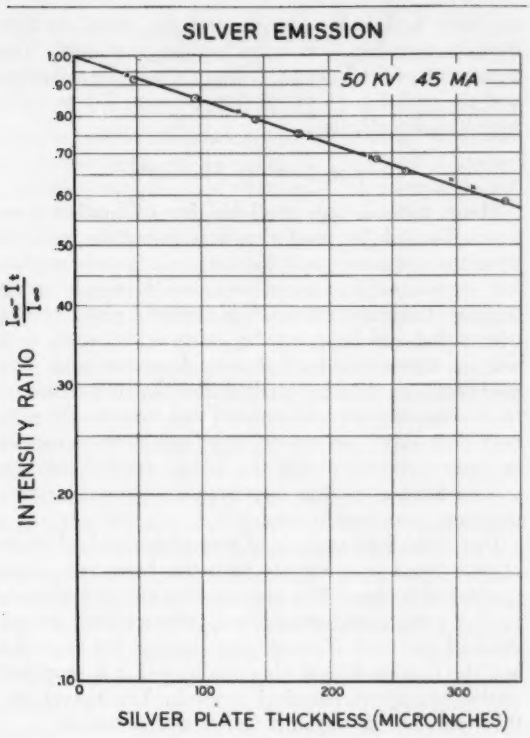


FIG. 6

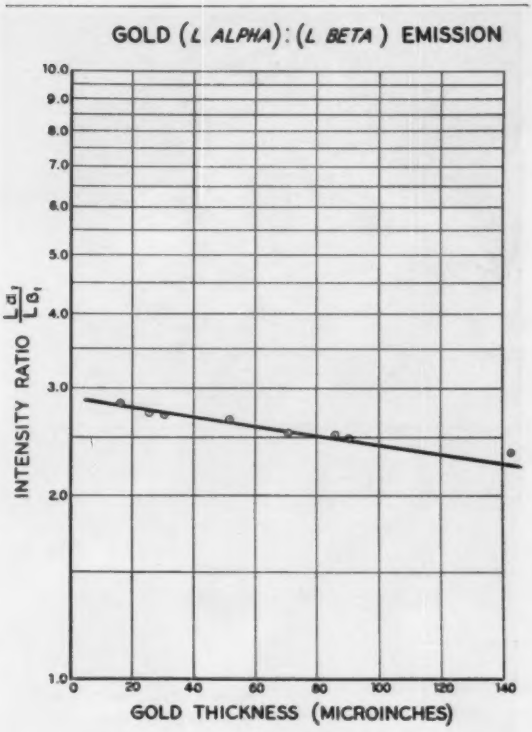


FIG. 7

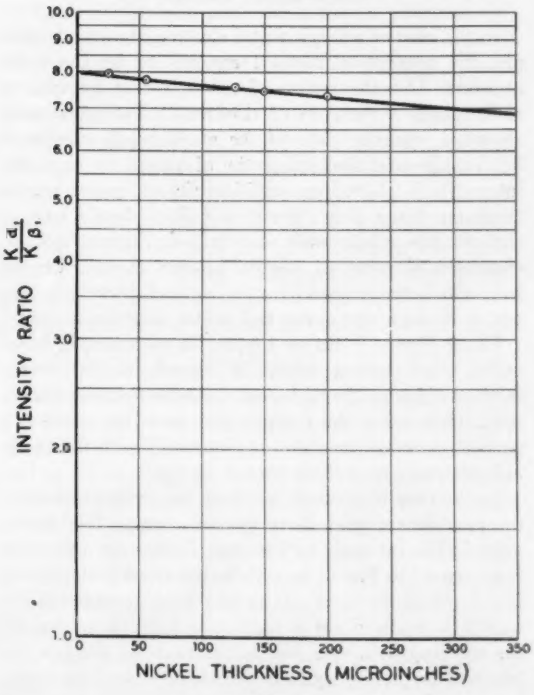


FIG. 8

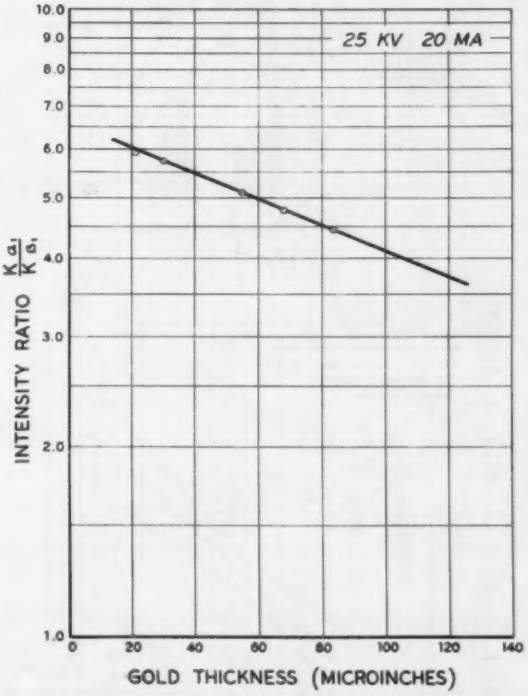


FIG. 9

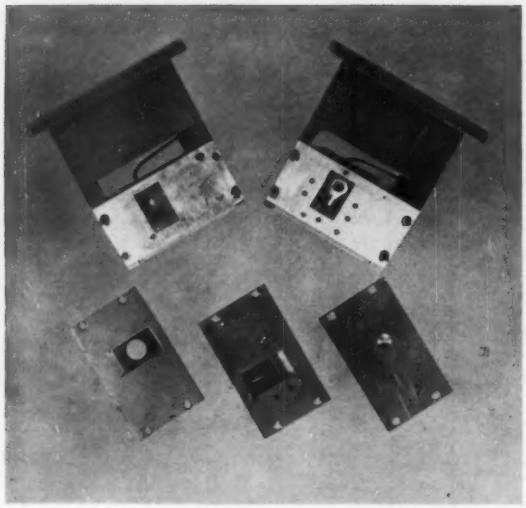


Fig. 10

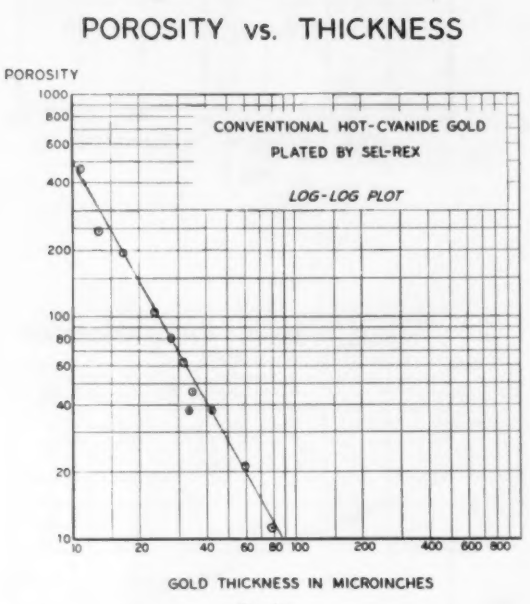


Fig. 11

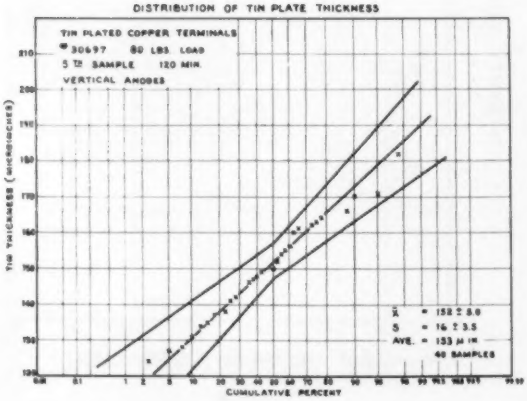


Fig. 12

substrate K-alpha absorption and the plated coating K-alpha emission techniques for the most part. The absorption of the K-alpha, K-beta ratio of the substrate and the emission of the plating L-alpha, L-beta ratio were also investigated.

Preparation of Standards

Many methods are available for calibration purposes. Two of the most simple ones are the gain of weight measurement on a known area after electroplating or vacuum deposition, or a loss of weight using suitable stripping methods. For example, gold deposits over nickel and brass can be immersed in nitric acid and the substrate dissolved away from the gold. The gold plate can then be weighed directly. In the case of tin on copper, hydrochloric acid will strip the tin with very little attack on the copper. Optical measurement on cross-sectioned pieces, the limits of which are described later, as well as interference microscope measurements, may also be used.

One of the best methods of preparing standards is to plate a large area sample with the back and edges masked off by tape. This reduces edge effects and tends to give a more uniform surface. After plating, several discs of one inch diameter are stamped out in a die and the coating weight obtained by either a stripping method or direct chemical analysis. The curves are then cross checked against optical measurements.

Caution must be exercised, particularly in thicker coatings, for uneven surface plating. The X-ray intensity values may not be the true value of the average plate thickness of the entire plate but more representative of a thin area which had been measured under the X-ray beam.

Calibration Curves

In the case of a single metal electroplate over a sample, the absorption method appears to be the most accurate. The absorption of the substrate fluorescent radiation is a measure of thickness.[5] The previously recorded intensity data of the standards is corrected for background and the ratio of plated to unplated intensities is plotted on semi-logarithmic paper versus thickness. Since this absorption follows Beer's Law, a straight line relationship is obtained. Figures 2-4 are examples of some of the calibration curves. Curves have also been prepared for tin on steel, nickel on copper, palladium on copper and solder plate on copper.

Using Figure 2, tin on copper, as an example, it requires a 1.1 percent change in intensity at 100 microinches to change the thickness measurement one microinch. This makes the method very sensitive, since a 1 percent counting precision is obtainable with the available intensity in a short period of time.

In the case of multiple platings the exterior plate is the most meaningful. Here the emission method is required. The intensity of the plate fluorescent radiation is compared to that of an infinite thickness plate, which is defined as the thickness at which no increase of intensity is realized for a particular kilovolt setting of the spectrograph. One minus the ratio of the two intensities is plotted against thickness[6,7] and on semi-logarithmic paper yields a straight line. Figures 5-6 are examples of this method.

In Figure 5, gold on copper, a change of 1 microinch at 100 microinches requires approximately a 0.3 percent change in the gold intensity.

Another emission technique which was investigated was the L-alpha: L-beta ratio of the coating. An example of this is shown in Figure 7. Here gold L-alpha: L-beta is plotted against thickness. This method should not be as sensitive to curvature, instrumental changes, or kilovolt changes over a limited range. However, it is obvious from this plot that the slope of the curve is not as steep as the emission curve and, therefore, for large changes of thickness there are only small changes in the ratio. With a change of one microinch in thickness, the ratio change is only 0.005 unit at 100 microinches. For a one percent variation of intensity in opposite directions for the K-alpha: K-beta values, a change of 9 microinches is obtained. This indicates less sensitivity for this method.

Since Figures 2-4 show that absorption methods are useful, the absorption of the nickel barrier plate radiation in the case of gold over nickel over brass was investigated. The nickel thickness varies considerably within a single lot; therefore, unless the nickel thickness is known for each terminal, a method independent of thickness must be used.

The K-alpha: K-beta ratio of nickel was plotted against nickel thickness (Fig. 8). The ratio does not appear to be constant enough to eliminate nickel variations over the desired range of thickness. Between 50 microinches and 300 microinches the ratio changes 0.79 unit. This change translated to the absorption curve (Fig. 9) would mean 31 microinches error due to nickel thickness variation.

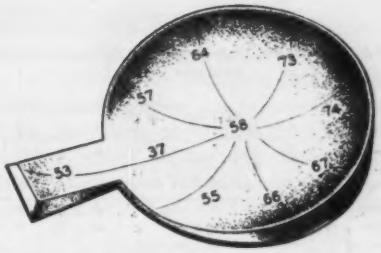
The absorption of the K-alpha: K-beta ratio by the exterior plate on massive nickel could be a measure of thickness of the gold plate (Fig. 9). A graph of this ratio absorption versus thickness indicates the slope of this line is not as steep as a straight K-alpha absorption. Here 0.025 unit change is equivalent to 1 microinch. The L-alpha emission and K-alpha absorption techniques therefore, were chosen as the best methods.

In order to measure both nickel and gold simultaneously a curve would be required for each gold thickness or range of thickness. Without a simple method general enough to measure both plates at any particular thickness this approach was discarded. Nickel thickness can be read by absorption of the copper radiation prior to gold plating and treated statistically.

Precision

The precision of the X-ray measurements, of course, is determined by counting time. The more counts accumulated, the less the error. A reasonable value for gold emission (Fig. 5), based on a 1 percent 2-Sigma value (40,000 counts), when translated to thickness gives at 30 microinches ± 1 microinch, at 60 microinches ± 2 microinches, at 90 microinches ± 3 microinches. With positioning errors and curvature errors this value could double.

A light microscope theoretically can separate or resolve two points in the order of 7-8 microinches at best. In practice this value is considerably higher.[10] The area of measurement is extremely small and tells one very little about the overall surface. Table 1 shows



THICKNESS DISTRIBUTION ACROSS SURFACE OF GOLD PLATED PADDLE

Fig. 13

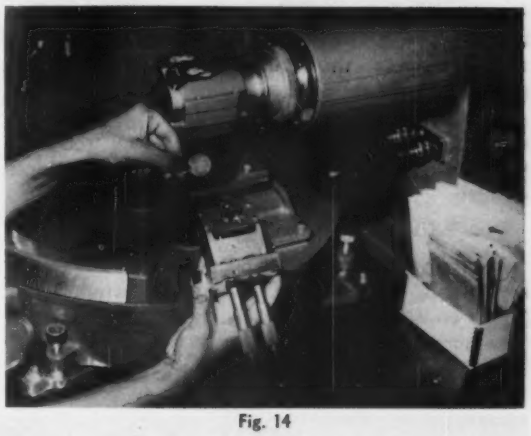
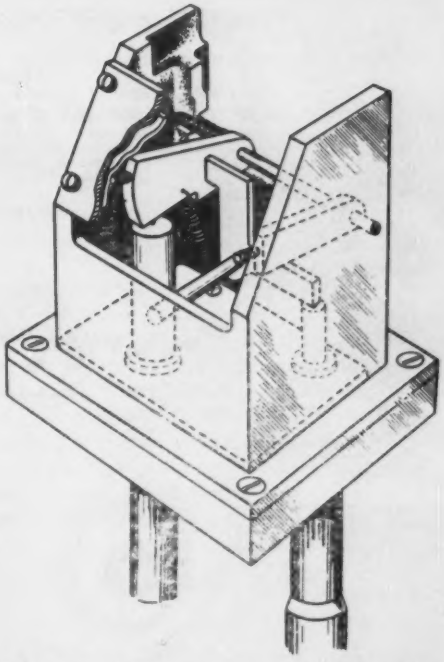


Fig. 14



MICRO ADJUSTMENT MECHANISM FOR X-RAY SAMPLE DRAWER

Fig. 15

TABLE I

COMPARISON OF X-RAY AND OPTICAL THICKNESS MEASUREMENTS
GOLD over COPPER

SAMPLE	METHOD	DETERMINATION NO. 1	2	3	4	5	6	7	8	9	10	AVE
A	OPTICAL	10 *	15	10	10	10	25	30	15	20	25	17
	X-RAY	10	11	9	11	11	13	12	12	12	12	11
	WT	15	(GOLD WEIGHED AFTER STRIPPING FROM BASE METAL)									15
B	OPTICAL	30	40	50	40	45	55	40	35	40	40	42
	X-RAY	28	28	30	28	27	28	27	25	28	26	28
	WT	31	–	–	–	–	–	–	–	–	–	31
C	OPTICAL	65	70	80	65	80	80	80	80	95	60	76
	X-RAY	51	49	48	49	50	49	52	51	52	50	50
	WT	53	–	–	–	–	–	–	–	–	–	53
D	OPTICAL	165	180	170	160	185	200	210	180	185	175	177
	X-RAY	142	136	135	140	126	142	134	131	132	140	136
	WT	–	–	–	–	–	–	–	–	–	–	131

* THICKNESS LISTED IN MICROINCHES

the comparison of microscope measurements with X-ray and weight methods. Since thin areas of plate contribute more intensity than thick areas, the X-ray thickness falls between the microscope average and minimum. The X-ray thickness does correlate well with thickness determinations made by weight gain or loss methods.

Size and Shape Considerations

Naturally, the most desirable surface is a flat one; however, in our particular case, it is sometimes hard to find an area which is reasonably flat. The thickness measurement is reliable if the curvature is across the beam planes. If it is in the beam plane and has small radius, considerable errors result. The radiation from the back side of the curvature has an additional exit path from that in the front, which causes errors in the measurement.

Wax impression molds and other positive sample placement devices are utilized. Since the measuring techniques are comparative ones, each sample should be placed under the beam at as near the same spot and distance from the tube as possible.

Masking techniques (Fig. 10) are necessary since, in some cases, only the gold thickness at a contact point must meet a specification. We have used steel masks and limited the area to as small as 0.060 inch for some measurements. Micro beams may also be used as is decribed later.

Applications

Since reliable thickness measurements are now available we shall discuss the use of this information. Porosity measurements have always been of the utmost importance for protection against corrosion. Figure 11 shows the correlation between gold plate thickness by X-ray and gold porosity obtained by chemical methods.[11]

Another useful application is in the study of barrel plating distributions. Variations of current density, hole size of the barrel, position in the barrel, as well as mixtures of different size pieces in the same mixture,

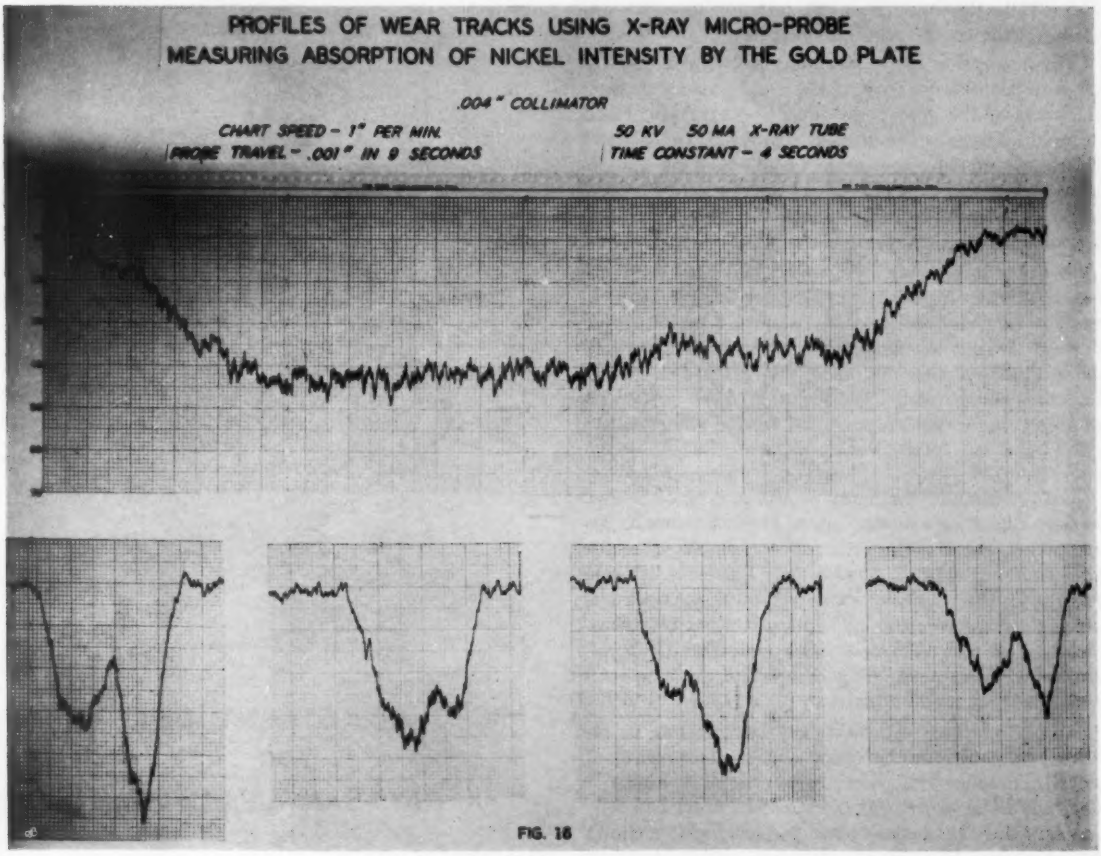

PROFILES OF WEAR TRACKS USING X-RAY MICRO-PROBE
MEASURING ABSORPTION OF NICKEL INTENSITY BY THE GOLD PLATE
.004" COLLIMATOR
CHART SPEED – 1" PER MIN.
PROBE TRAVEL – .001" IN 9 SECONDS
50 KV 50 MA X-RAY TUBE
TIME CONSTANT – 4 SECONDS

FIG. 18

may be studied. Figure 12 shows such a distribution obtained by X-ray methods.

By masking down the exposed area, point by point thickness measurements can be made which show the variation of thickness over the surface. Areas of high current density are thus determined (Fig. 13).

An extremely useful application of absorption methods is illustrated by the use of a micro beam unit (Fig. 14 and Fig. 15). This unit was designed to do gold plate wear studies as well as micro analysis,[12] which has been previously described. In the gold wear studies, small wear tracks made by a moving stylus were traversed by the X-ray beam across both the length and width of the track. The motor-driven micrometers, combined with recording of intensity through the ratemeter, gives a profile of the wear track (Fig. 16). The depth can be measured with each group of wear cycles, which gives a wear rate. The overall track is also masked off, and the change of substrate intensity with wear is counted and correlated to number of cycles and load for various hardnesses and types of gold.

Conclusions

The X-ray methods are fast becoming the best, and sometimes only, means of getting quantitative data on thickness. They are rapid, non-destructive and accurate.

Being non-destructive in nature, these techniques lend themselves well to research problems where basic studies can be made on the individual part previously measured for plate thickness.

We also feel that there are applications in production and control which, in the near future, can be made completely automatic for odd shaped parts, such as we manufacture, by the use of X-ray techniques.

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CHROME PLATING HIGH-LOADED COMPONENTS

(*Continued from page 66*)

The high usefulness of the method of strengthening of steel surface by rolling with rollers prior to plating was also proved in industrial experiments with pump shafts. Figure 1 shows a diagram of the transmission shaft of the pump.

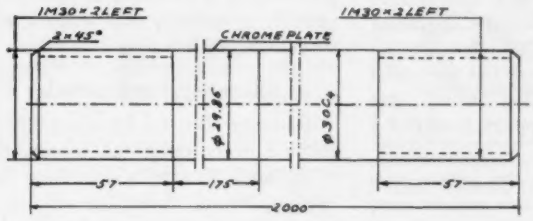

FIG. 1

Tests were conducted with 39 shafts of the transmission lines of the artesian pump working in a well 80 meters deep. Nine shafts were of an ordinary serial production, and 30 test shafts were plated with 0.035-0.095 mm of chromium. The test shafts worked on five well floors.

The method of rolling the shafts before plating was as follows: The rate of shaft revolution was 43 meters/minute; the advance of the rollers was 0.2 mm/revolution; the pressure on the roller was 500 kg.; the diameter of the roller was 32mm; the number of passes was 2. Cooling was accomplished with the heavy use of oil.

As a result of rolling, the microhardness of shafts increased 33% (H_V = 182-242 kg/mm^2) on the average. Testing shafts in the well for 1100 hours indicated that the shafts with 0.076-0.095 mm chromium plate deposited on the rolled surface possessed the highest wear resistance and corrosion-fatigue resistance.

In salvaging mining equipment in Russia, high-loaded parts are often chromium plated without the preliminary treatment. Stationary fittings also reduce the fatigue life of shafts under pressure, similar to chromium plating. Therefore, in the case of these parts or similar components, which cannot stand reduction in fatigue life, work hardening the surface by rolling with rollers prior to plating offers a good solution for the problem of neutralizing the harmful tensile stresses arising as a result of chromium plating.[4]

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SHOP PROBLEMS

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gladly received and the sender's name will be kept confidential, if desired.

Nickel Electroforming

Question: We are electroforming nickel on a stainless steel mandrel and, occasionally, have trouble in separation. This difficulty does not appear to be due to adhesion of the deposit to the mandrel, since a thin deposit can be peeled off without much effort. However, deposits of any appreciable thickness from the Watts bath cannot be slipped off, even though the mandrel is tapered. We would appreciate any suggestions you might be able to offer.

C. D. J.

Answer: Recent Japanese work (N. Kinoshita, K. Kawakami and K. Kumura. J. Metal Fin. Soc. Japan, **11**, 357. 1960) has revealed that tensile stress in the deposit is an important factor. If stress-reducing compounds are added to produce a very low tensile stress or a compressive stress, separation of the electroform from the mandrel is easier.

Hard Anodizing

Question: We have some questions concerning hard anodizing of aluminum, which we trust you will be able to answer for us at your earliest convenience. Is the process suitable for all alloys or is it restricted to a few of the harder ones? What thickness of coating is practicable? Is there an appreciable change in dimensions?

W. F. M.

Answer: In general, the process is suitable for alloys containing less than 5% copper or 8% silicon. 24S alloy is borderline. While coatings up to 0.012" thick have been produced, the thickness usually specified is 0.001-0.003", and 0.002-0.006" for salvaging castings.

Since approximately one-half of the coating thickness is growth, each mil of thickness will result in one mil increase on a diameter. Where tolerances must be closely held, it is advisable to allow for honing or grinding after coating.

Air-Agitated Nickel Solutions

Question: Would you please outline the relative advantages and disadvantages of air-agitated bright nickel baths, as against the usual mechanically-agitated ones. We are now using the latter and have been impressed with certain claims for the former. However, we do not know how much to allow for sales enthusiasm, and hesitate to change over unless we can be certain that we are taking the right step, which your comments will certainly help us to decide.

A. T.

Answer: Conversion from regular bright nickel to the air-agitated process will necessitate purchase of a low pressure air blower capable of delivering about 1½-2 cu.ft./min. for each square foot of tank surface. A pressure of about 4-5 lbs./sq.in. is needed. In addition, plastic air distribution pipes are required in the tank. Continuous filtration is a must, and the operating costs will be somewhat higher, due to the power requirements and increased brightener consumption which has been estimated at approximately 15-20%.

To counterbalance the above, air-agitated solutions operate without wetting agents and have a much lesser tendency to produce passive nickel. Because much higher current densities can be employed, output from an installation of given size is increased. Continuous carbon treatment is possible, which keeps down organic contamination. High evaporation losses permit use of solution from the reclaim tank in sufficient quantity to show a net saving, despite the additional costs of operation. Indications are that the deposits have better corrosion resistance because of high ductility and low stress. Incidentally, if the air-distribution piping is correctly designed and installed, roughness due to the small amount of dirt present in any solution is surprisingly low, much less than would be produced in a regular bath with mechanical agitation even at lower current densities. This is probably due to the scrubbing action of the air stream.

Ferrous Bright Dip

Question: We would appreciate any information you can furnish on a bright dip for iron, identified as A.R.D.E. We regret that we have no additional information to help you identify this process.

G. L. R.

Answer: This is the commonly-called "Marshall" process, named after the developer. The initials stand for "Armament Research & Development Establishment" of the British War Office in Fort Halstead.

The process consists of immersion for periods up to 20 minutes or more in the following solution:

Oxalic acid crystals	25 g./l.
100 volume hydrogen peroxide	40 ml./l.
Sulfuric acid	0.1 g./l.

Usually, the acid present in hydrogen peroxide as a stabilizer is sufficient to provide a suitably low concentration of mineral acid.

Cleaning Lead Anodes

Question: Do you have any effective method of cleaning the orange crust from lead anodes which have been hanging in our chromium solution for a long while without being used. It seems to be a non-conductor and interferes with our current input, and brushing does not have any effect at all. We would be grateful for an immediate reply.

G. C.

Answer: An effective cleaning method, suggested by L. Missel (METAL FINISHING, **55**, 56. Jan. 1957), consists of overnight immersion at room temperature in a soution of

14 oz./gal. each of caustic soda and Rochelle salt. The loose smut remaining is then brushed off. The action is said to be speeded by increasing the Rochelle salt concentration, and a steel or lead-lined tank is used.

Platy Pigments

Question: I would like to know what is a Platy Pigment, which I have read is used in alkyd paints. It is not listed in any technical dictionary or handbook in my possession.

R. O'M.

Answer: Platy pigments are usually employed as extenders for the hiding pigments in paints, and are flakes of mica, aluminum, or stainless steel. The Wet Ground Mica Association in New York recently published a technical bulletin, which is available at no charge, comparing these pigments in alkyd paints.

Cobalt Determination

Question: What analytical procedure would you recommend for determination of cobalt in a cobalt-nickel alloy plating solution? This is a regular sulfate-chloride bath. I could use a method which is not very involved and does not require special equipment for the analysis, because my facilities are limited.

A. D.

Answer: In the following procedure, which is volumetric, all the reagents can be made up readily, or are available as stock items from any large laboratory supply house.

1. Pipette a 10 ml. sample into a 250 ml. Erlenmeyer flask and add 90 ml. distilled water and 7 ml. of 20% sulfuric acid.

2. Add 5 grams sodium perborate and, after the solution clears, add sodium hydroxide until the solution is alkaline.

3. Boil for 15 minutes, cool to room temperature and add 5 grams potassium iodide, followed by 25 ml. sulfuric acid (20%).

4. Add starch indicator and titrate with standard 0.1 N. sodium thiosulfate until the blue color disappears.

Each ml. of thiosulfate is equivalent to 0.0059 g. cobalt, or 2.81 g./l. $CoSO_4.7H_2O$ for a 10 ml. sample of plating solution.

The nickel in the solution will not interfere with the analysis, but the oxygen from the perborate must be boiled off completely.

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Science for Electroplaters

65. Variables in the Watts Bath

By L. Serota

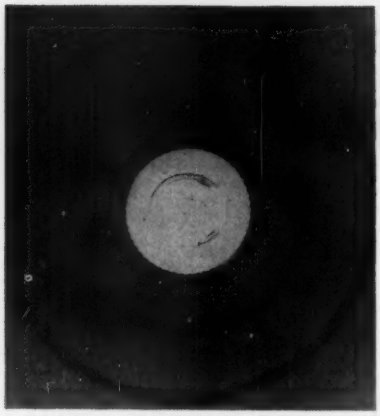

Fig. 1

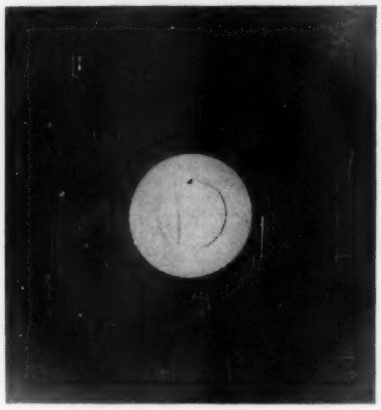

Fig. 2

IN considering the effect of variables in a Watts bath upon the physical properties of electrodeposited nickel, A. Brenner and associates differentiate between two distinct types: thin nickel deposits used for decorative purposes, in which such properties as surface appearance (color and reflectivity), hardness, abrasion resistance, and ductility are emphasized, and heavy electrodeposits of nickel used for electroforming and the building up of worn parts, where the physical properties of concern are mechanical, such as internal stress, tensile strength, hardness and ductility, yield strength, and fatigue strength.

Deposits from a Watts bath, they observed, as evidenced by x-ray diffraction patterns, are dual and coarse grained, and exhibited lower hardness, tensile strength, resistivity, as well as lower amount of impurity, than nickel deposits obtained from all-chloride, organic bright nickel, or chloride-acetate baths. The relationship is emphasized by the sharpness of the pattern obtained with a sample from the Watts bath, coarse grain (Fig. 1) compared to the diffuseness of the pattern obtained with a specimen from an organic bright nickel bath, fine grain (Fig. 2). Small grain size, as indicated by photomicrographs as well as diffuseness of x-ray diffraction patterns, provided added support to the view, the authors contend, that such deposits are associated with the brightness of nickel deposits.

C. L. Clark and S. H. Simonsen, on the other hand, in their study of the relationship between orientation, grain size, and brightness in electrodeposited nickel, using x-ray diffraction techniques, found that x-ray grain sizes of mat, semi-bright, and bright deposits were of the same order of magnitude, and concluded that no correlation existed between orientation of the crystals and brighter deposits; also, brightness is not attributed entirely to grain size, since the same order of magnitude was found for mat, semi-bright, and bright nickel deposits.

F. Denise and H. Leidheiser, in a later x-ray study of the effect of a wide range of organic compounds on the crystal growth of nickel deposits, report that, although most bright nickel plates formed in the presence of organic compounds show small grain size, there is no correlation between preferred orientation and brightness. About 50 per cent of the mirror bright deposits, they found, gave no evidence of preferred orientation. The fact is stressed, however, that bright nickel plates were obtained with small grain size and no preferred orientation, as well as with complete orientation and large grain size. Fig. 3 represents a schematic drawing of the device used to obtain back reflection x-ray patterns.

Stress

A significant characteristic of many electrodeposits, especially of hard metals, including nickel, first observed by E. J. Mills in 1877, is that such deposits are frequently in a condition of stress. When he first chemically coated with silver the bulb of a thermometer, then coated electrolytically with different metals, the column of mercury varied in height, independent of temperature. The term electrostriction was used for this phenomenon. Copper, silver, iron, and nickel, he reported, were found to constrict the bulb (tensile stress), causing the mercury column to rise, while the effect of stress resulting from deposits of cad-

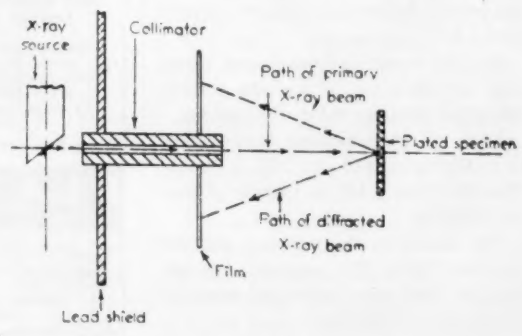

Fig. 3. Schematic drawing of back-reflection X-ray setup.

mium and zinc was compressive, with values for the column of mercury being slightly lower.

The effect of stress on the quality of commercially plated articles, investigators indicate, may be a cause of peeling, blistering, cracking, or distortion of light gauge metal and electroformed parts. The study of this problem was accelerated around 1946 when some of the above-mentioned difficulties were experienced with bright nickel deposits used for automobiles, especially on bumpers.

With electrodeposited nickel, internal stress may result. The deposited metal under such condition will bend, giving a concave surface with the nickel on the inside of the curve. The release of the stress, in this instance, is an indication of tensile (contractile) stress in the deposit. In cases where the electrodeposited surface becomes convex (cadmium and zinc) and the stress is relieved by expanding, the stress is considered compressive (negative). W. Blum states that stress in an unpurified solution of a Watts bath may be 50,000 psi and, in a regulated, purified solution, the stress may be reduced to 15,000 psi.

G. G. Stoney (1909) devised a method for measuring stress in deposits on a principle which provided the basis for subsequent stress-measuring instruments, such as the Brenner Spiral Contractometer and more recently the Kushner Stresometer, by depositing nickel on the side of a steel rule. Stoney found that the rule curved, with the deposited metal on the inside of the curve, indicating contraction of the nickel. Fig. 4 is a diagrammatic representation of this method, with N representing the thickness of the deposited layer, t the thickness of the test strip, L the length of the plated part tested, d the deflection of the strip resulting from the curvature of the test piece. $S = \frac{2Et^2d}{NL^2}$, where E is the modulus of elasticity of the test strip.

A. Brenner, referring to stress, during a discussion period concerned with physical properties of electrodeposited nickel, implied that stress, as measured, is a bulk stress rather than internal stress. The division of such stress in electrodeposits, he suggested, is between macrostress, which is compared to the contractile stress in a strip under tension when the basis metal is removed, and micro- or internal stress

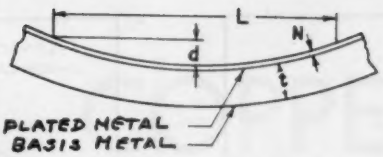

Fig. 4. Dimensions of test strip after plating.

(not affected by removing basis metal), which is compared to stress produced in cold work.

W. M. Philips and F. L. Clifton demonstrated that the curvature in a nickel plated strip could be attributed to the nickel deposit by removing the plate from the basis metal, chemically with nitric acid from steel, mechanically from stainless steel. By measuring the curvature immediately after plating and, again, after removal of the nickel, they found less than 5 per cent (an average of 4.2 per cent) of the curvature remaining in the metal strip. Their observations led to the conclusion that the resultant stress was in the electrodeposited nickel.

The effect of stress, as deformation, in an electrodeposit, may not be noticeable when the basis metal is sufficiently stiff. Under such conditions, the internal stress cannot be released. J. B. Kushner refers to such locked-in stress as residual stress. C. E. Heusner indicates that inasmuch as most plated parts are usually rigid enough not to curve (flex) during plating, interest is directed to the stress present in the plate before the stress is released.

High tensile stress in electrodeposited nickel will tend to release itself by cracks, showing in the deposit (Fig. 5). This effect, J. B. Kushner indicates, will occur when the ductility of the nickel deposit is low, since the deposited metal will not flow under stress. The stress will be relieved, accordingly, by cracking.

Fig. 5. Stress cracks in panel originating at stamped number.

W. A. Wesley considers the following order of mechanical properties most favorable for providing a good quality of electrodeposited nickel: high ductility, low stress and, finally, high tensile strength. In support of this view, the following condition was considered. If nickel deposited on steel exhibited high positive stress and had good ductility, then, for the nickel to crack, elongation (locally) would have to be more than 0.01 inch per inch (one per cent). Without the introduction of the external stress, the one per cent stretch of the nickel would require the tensile stress in the deposit to change one per cent of the modulus of elasticity of the nickel (30 million psi), which corresponds to a change of stress of 300,000 psi. Accordingly, a deposit with one per cent ductility would enable the stress to be relieved locally before cracking occurred.

W. M. Philips and F. L. Clifton state that highly stressed nickel deposits are not suitable for use as bumper guards or bars in a car, since the external stress, due to the bolt tension when the bumper is attached to the car, may rise to 40,000 psi. This stress-strain may cause both the deposit and the basis metal to stretch. Then, too, additional stress may result when cars bump.

K. G. Soderberg added the comment, during this discussion period relating to stress in nickel deposits, that the stress of 40,000 psi of the bolt tension when a bumper is attached to the car, plus an internal stress of the plate at perhaps 31,000 psi, giving a total stress of 71,000 psi, may be above the tensile stress of the deposit, and in that manner induce cracking. Soderberg also implies that results now indicate that fine check cracks (previously considered pores in the deposit), as well as large cracks, are attributed to internal stress.

A. Brenner and associates found, in their study of physical properties of electrodeposited nickel, that deposits of nickel from a Watts bath, pH 5.8, on copper tubes would crack when the copper (basis metal) was removed.

The substitution of electrodeposited low-stress nickel for microwave plumbing, such as microwave tubing, reentrant cavities, and adaptors, was investigated by V. J. Marchese. He found that an appreciable reduction in stress

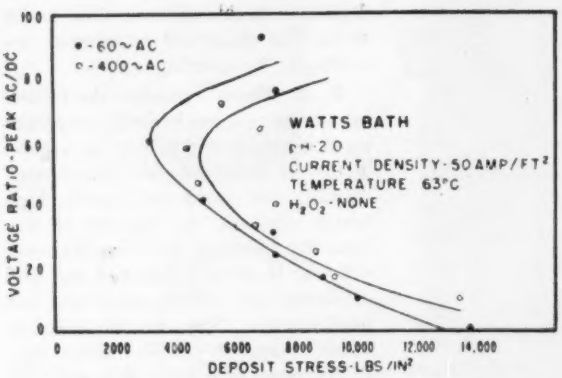

Fig. 6. Results of superimposing 60-cycle and 400-cycle alternating current on direct current with a bath pH of 2.0.

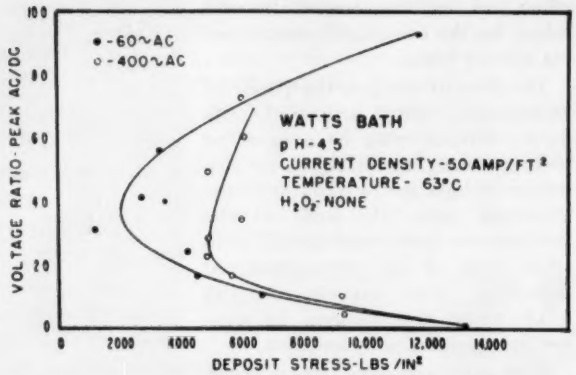

Fig. 7. Results of superimposing 60-cycle and 400-cycle alternating current on direct current with a bath pH of 4.5.

(to as low as 2000 psi) from a purified Watts bath is possible by superimposing 60 cycle (and 400 cycle) alternating current on the direct current. The low-internal-stress nickel is preferable for electroformed microwave equipment in place of copper or iron because of its rigidity, thereby permitting a thinner-walled, relatively lightweight unit. In addition, the superior corrosion-resistant properties of electroformed nickel wave guide equipment provides a distinct advantage.

Superimposition of alternating current on direct current, it was found, reduced pitting, but did not eliminate it completely. When the deposit stress was plotted against the ratio of the peak voltage of the superimposed alternating current to direct current voltage, at a current density of 50 amp./ft.², 63°C., at a pH of 2.0 (Fig. 6), and again at a pH of 4.5 (Fig. 7), lower stress reduction resulted in both baths with 60 cycle alternating current than that obtained at 400 cycles alternating current. At a pH of 2.0 the curve shows a minimum stress value when the ratio of alternating current peak voltage to direct current voltage is 6.0; and at a pH of 4.5 the values indicating the minimum are obtained at a ratio of about 3 to 1 of alternating current peak voltage to direct current voltage. This latter bath, with 60 cycle alternating current which the author found produced minimum stress, was used for electroforming. Pitting was eliminated by the addition of 0.1 g./l. wetting agent.

(To be continued)

FOREIGN LITERATURE

Concentration of Alkali Salts in Electrolytic Cleaning Baths

P. Westphal: *Galvanotechnik* (Germany), **47**, No. 12, 541.

It is normal practice to prepare electrolytic cleaning baths with a concentration of 30 to 100 g./l. alkali salt. The formulations used vary to a considerable extent. While salt concentrations of 30 to 50 g./l. for cathodic and 75 to 100 g./l. for anodic cleaning processes are in widespread use, higher salt concentrations are also used.

In the case of parts with a large surface area, the baths should contain quite large amounts of alkaline electrolyte salt, of the order of 250 to 300 g./l. Only potassium salts should be used here because a high solubility is required with the large amounts used and a good electrical conductivity is also required. Crystallizing-out of the salt on the ware, too, is undesirable.

A reduction in the salt concentration is possible in the case of heated baths because the electrical conductivity of the hot baths is greater than that of the non-heated baths. However, in the case of components where very obstinately-adhering grease and dirt coatings are present on the surface, raising the salt concentration will be of advantage. Variations in bath compositions will be governed mainly by local considerations and operating conditions.

Electrolytic cleaning can be conducted both cathodically and anodically. Which is used, will depend primarily on the chemical and electrochemical behavior of the metals to be cleaned. Iron alloys containing carbon, such as cast iron and steel, which are normally processed on the large scale, are degreased both cathodically and also anodically. It should however be pointed out that, with the application of too-high an anodic current, they can be damaged by pitting corrosion.

The more sensitive non-ferrous metals are easily discolored during anodic cleaning. Aluminum is generally cleaned cathodically. Brass or the other copper alloys can be cleaned both cathodically or anodically. However, because of the oxidizing tendency of copper, in anodic cleaning these metals become covered relatively easily with oxide coatings. For this reason, cathodic cleaning is more frequently employed.

The advantage of anodic cleaning, as compared with cathodic, lies in the fact that hydrogen is not generated on the parts being treated; gaseous oxygen is discharged on the anodic parts, which is not adsorbed by most of the metals. Hydrogen embrittlement, accordingly, does not occur in anodic cleaning. In all cases in which hydrogen can lead to a reduction in the adhesion of subsequently applied plated coatings, that is in most cases, either anodic cleaning should be used, or cathodic followed by an anodic treatment.

Surface Treatments for Molybdenum

Metall Reinigung (Germany), **9**, No. 8, 134.

Before molybdenum metal can be electroplated, the surface must be prepared by special pretreatments, as is the case with aluminum, magnesium, and titanium. As the electroplated

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The softness of copper necessitates special methods and abrasives in finishing the surface. This metal is generally considered to flow readily during polishing and buffing operations and for this reason copper plate finds extensive application as an undercoat for nickel plate. Minor scratches and depressions in the base metal surface are filled with metal in this manner. General methods for the finishing of copper plate will be covered in a later Methods Sheet.

FLEXIBLE POLISHING... Removal of spinning marks, pits, small defects, etc., is usually done by flexible polishing with Grade "C" LEA COMPOUND on a loose muslin buff at about 6000 sfm.

SATIN FINISHING... This final finish is usually produced with Grade "C" or Grade "A" LEA COMPOUND on loose muslin buffs, ventilated or bias buffs, string or wick wheels. Buffs operating at 4500-6000 sfm will produce a fine satin finish on copper.

BRIGHT FINISHING... When a bright finish is required on solid copper articles made by casting or extrusion, the following procedure is typical:

1. Flexible polishing with Grade "C" LEA COMPOUND on a muslin buff with ⅜" spiral sewing at 5000 sfm.
2. Cut-down buffing with Grade 765 LEAROK or LIQUABRADE Grade TH62M, on a pocketed or ventilated buff at 7000 sfm.
3. Cut and color buffing with Grade 155 LEAROK or LIQUABRADE Grade UH20C on a full-disc, loose or pocketed buff at 7000 sfm.
4. Color buffing with Grade 309 LEAROK or LIQUABRADE Grade UH20A on a loose muslin buff at 6000 to 7000 sfm.

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AURO GLO 12

—an acid type alloy, bright gold, producing shades of a hamilton color. Particularly adaptable for decorative finishes. Bath has wide bright plating range, produces deposits of exceptional hardness (375-400 Knoop). Simple color control.

for bright high speed gold plating

AURO GLO H. S.

—a neutral type, high speed bright gold. Deposition rates of 0.003 inches per hour can be obtained from standard bath. Can utilize the same equipment as standard cyanide golds. Simple to control. Broad bright plating and temperature range.

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molybdenum will be exposed to high temperatures under service conditions, perfect adhesion of the coating is essential. Various pretreatments have been developed, suitable for different specialized applications.

The alkaline ferricyanide bath is used where iron, chromium, or nickel coatings are to be applied; it should not be used for copper plating. The molybdenum parts are dipped for 1 minute in an aqueous solution consisting of 100 g./l. potassium hydroxide, and 300 g./l. potassium ferricyanide, at 21-33°C. A nitric acid dip is always used in combination with this. The molybdenum is treated anodically for 30 to 90 seconds in 30% potassium hydroxide at 49-100°C., and 14 amp./dm^2. using stainless steel cathodes. The parts are rinsed in flowing water, dipped in 1:1 nitric acid at room temperature for 20 to 60 seconds (until uniform gas generation occurs) and then again thoroughly rinsed in water. The molybdenum is then dipped in the alkaline ferricyanide solution in order to remove the surface film formed in the nitric acid. For subsequent chromium plating, the ferricyanide dip is 15 seconds at 85° to 100°C.; for nickel plating, the dip is 15 seconds at room temperature. Thorough rinsing is again given after the ferricyanide dip. In the case of chromium plating, this treatment cycle should be repeated three times.

The alkaline ferricyanide treatment can also be given after a dip in 15% to 50% hydrochloric acid solution, followed by rinsing. The hydrochloric acid dip bath is used for chromium plating. The molybdenum is first cleaned in a normal electrolytic cleaning bath and rinsed in flowing water. It is then dipped for 1 minute in 50% hydrochloric acid rinsed and chromium plated.

A dip in hydrofluoric acid is used for nickel and chromium plating treatments. The molybdenum is treated in concentrated hydrofluoric acid at 21 to 33°C. and 70 amp./dm.^{2} a.c. for 3 minutes. A sulfuric acid dip can also be used for chromium plating. If the molybdenum is heavily oxidized, it is cleaned in a 10% sodium hydroxide solution at room temperature with a.c., 25 volts, for 20 seconds. The sulfuric acid bath can vary from concentrated to 1:2 dilution. Molybdenum alloys containing copper form a brown film which does not interfere, however, with subsequent plating. The bath voltage varies between 24 volts for the conc. acid down to 10 volts, while the current density varies from 10 to 30 amp./dm.^{2} The treatment time is around 30 seconds at 21 to 33°C.

Nitric Acid Pickling Treatments in Hot-Dip Tinning

H. Anders: *Metall Reinigung*, **9**, No. 8, 136.

One of the chief defects which can arise in hot tinning steel is that known as "tear" formation, due to imperfect wetting of the steel surface by the fused tin. When the ware is withdrawn from the tin bath it will show a mirror-bright surface but, just before the coating solidifies, it runs together to form drops. Correct surface conditioning by suitable pretreatments, as described below, can serve to prevent this trouble. These treatments are as follows:

1. Heating at a dull red heat. This process is not always applicable, as the article is heated-up and is softened. In addition, the character of the surface is changed. Precise temperature control is necessary. The possibility of "tear" formation is removed almost completely by the heat treatment.

2. Air oxidation treatment. This process, which should be conducted after degreasing and in conjunction with pickling, generally gives good results. A disadvantage is that the oxidation process cannot always be controlled exactly, and depends greatly on weather conditions. A considerable time is also required.

3. Pickling with nitric acid. Although this process has been employed for many years, it is seldom used as it is considered that the attack of the nitric acid is too strong.

To achieve uniform results, the following procedure can be used.

1. The ware to be tin-coated is degreased carefully and, before pickling with the nitric acid, all traces of scale and oxides are removed;

2. The pickling time is controlled precisely;

3. The attack of the nitric acid is supervised carefully.

The dip time in the nitric acid ranges from a few seconds up to a maximum of 1 to 2 minutes. If tear formation occurs after the nitric acid treatment, then this has been too short. A matte appearance of the tinned surface indicates that the pickling time has been too long. The effectiveness of the nitric acid dip is dependent on its concentration, temperature, and the dissolved iron. A bath with nitric acid of 20 to 50% concentration can be used. As the acid heats up fairly rapidly during the pickling treatment, water-cooling of the bath should be provided.

The ware is rinsed carefully after pickling and given a dip in dilute sulfuric acid solution, before tinning. The nitric acid treatment has been found to be the most reliable process for the avoidance of "tear" formation.

Inhibitors for Aluminum Pickling Baths

M. Straschill: *Galvanotechnik*, **47**, No. 6, 270.

It is common practice to use inhibitors in steel pickling baths but, until now, they have not been used to any very great extent in aluminum treatment baths. The best known action in this respect is the protective effect of water glass in sodium carbonate solutions; at concentrations below 1%, attack on the metal can be prevented for the greater part. This effect is not present in caustic soda solutions. Accordingly, it can only be used with cleaning solutions free from caustic soda. Chromates and other oxidizing media also show a protective action.

In addition, there is a whole series of organic colloid compounds which give a more or less strongly protective action in alkaline solutions, particularly with alkaline carbonates. Such substances are gum arabic, glue, agar-agar, starch, and gelatine.

As mentioned above, water glass gives no protective action in caustic soda but oxidizing substances, such as chromates, do give a protective action. Some of the inhibiting compounds which are effective for steel in acid baths also give a certain protective action for aluminum in acid baths. This is particularly the case with hydrochloric acid. The following additions are effective in this respect: dibenzyl sulfide (0.1%) and nicotine sulfate (0.3%).

Condensation products of formaldehyde - phenolsulfonic acid, hexamethylene tetramine can also be used. In the case of sulfuric acid, chromates, nitrates, and nitrites have a delaying action. In the case of hydrofluoric acid, which finds widespread application for treating aluminum, it is possible that the compounds mentioned above for use with hydrochloric acid, would also be effective.

Patents

RECENTLY GRANTED PATENTS IN THE METAL FINISHING FIELD

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Electrostatic Spraying

U. S. Patent 2,966,310. *Dec.* 27, 1960. *J. Sedlacsik, assignor to Interplanetary Research & Development Corp.*

A fluent material spray nozzle for discharging an electrically charged stream of coating material.

Plating on Aluminum

U. S. Patent 2,966,448. *Dec.* 27, 1960. *T. J. Connor, assignor to General Electric Co.*

The method of preparing an aluminum containing article for the application thereon of an electroplated metal coating which comprises (1) immersing said aluminum base article in a hot bath containing alkali hydroxide and alkali potassium tartrate, (2) removing said article from said bath and rinsing said article, (3) immersing said article in a bath comprising an aqueous solution of zinc cyanide, alkali cyanide, alkali hydroxide and alkali sulfide until a thin displacement coating of zinc is deposited thereon, (4) passing a direct electric current through said bath with the article as the cathode at current densities up to the order of 1500 amperes per square foot at temperatures ranging from about 50°F. to 120°F. until a thin electrodeposit of zinc is applied thereto, and (5) electrodepositing a metal coating on said zinc coated article.

Applicator for Metal Salt-Reducer

U. S. Patent 2,967,112. *Jan.* 3, 1961. *S. E. Kay and R. J. Ball, assignors to Pilkington Brothers Ltd.*

A process of depositing a metal upon a surface by means of chemical interaction between a metal-depositing solution and a reducing solution, comprising injecting at controlled rates into a mixing chamber separate streams of the metal-depositing solution and the reducing solution to form a pool of liquid, and supplying compressed air to the chamber to mix the solutions intimately by forcing said pool of liquid through tortuous paths within the chamber and to expel the mixed solution from the chamber as fine droplets towards the surface to be coated before its components have interacted to form appreciable quantities of the metal.

Hard Acid Gold Bath

U. S. Patent 2,967,135. *Jan.* 3, 1961. *B. D. Ostrow and F. I. Nobel.*

An electroplating bath for producing hard and bright deposits of a metal selected from the group consisting of gold and gold-base alloys comprising an aqueous solution of a soluble gold-alkali metal cyanide, a sufficient amount of a substance taken from the class consisting of alkylol-, alkylene- and alkanol-amines having 1 to 12 carbon atoms and polymers thereof to produce a brighter deposit than is obtained in the absence thereof, said bath having a pH of about 2.5 to 6.5.

Chemical and Electropolish for Aluminum

U. S. Patent 2,967,136. *Jan.* 3, 1961. *A. Cybriwsky and N. Mostovych, assignors to Reynolds Metals Co.*

A method for surface brightening and polishing an article composed of a metal selected from a group consisting of aluminum and its alloys comprising: providing a bath consisting essentially of sulfuric acid, phosphoric acid and water, corresponding, in nature and amount, at room temperature to a mixture of commercial sulfuric and phosphoric acids in room temperature volume ratios ranging from 70% commercial sulfuric over 30% commercial phosphoric to 85% commercial sulfuric over 15% commercial phosphoric so that the total water-free acid content of the bath ranges from about 88½% to about 90½% of the total volume of the bath; heating the bath to a temperature ranging from about 200°F. to about 300°F.; and dipping the article into the heated bath for surface brightening purposes.

Hot Dip Coating Method

U. S. Patent 2,967,114. *Jan.* 3, 1961. *J. T. Mayhew, assignor to National Steel Corp.*

In a method for applying a metal coating to metal strip material in which metal strip material is passed through a liquid metal coating bath in a receptacle and between a pair of closely spaced rolls upon emerging from the bath and in which liquid metal coating material collects in a pool above the nip of the rolls at each side edge of the strip material, the improvement comprising the steps of positioning a heat conductive member adjacent each side of the strip material contiguous to the nip of the rolls with part of the member immersed in the pool and part exposed above the pool, and contacting the exposed part of the heat conductive member with flame.

Centrifugal Spraying

U. S. Patent 2,967,668-9. *Jan.* 10, 1961. *E. O. Norris.*

A spraying system comprising a centrifugal spray device including a rotatable atomizer defining an annular flow surface along which the material to be sprayed flows under centrifugal action and having a peripheral discharge edge.

Conversion Coating — Aluminum

U. S. Patent 2,967,791. *Jan.* 10. 1961. *R. A. Halversen, assignor to Parker Rust Proof Co.*

A method of forming a coating on the surface of aluminum which comprises the steps of contacting the aluminum surface with an aqueous acidic operating solution containing chromic acid, the fluoride ion, and having a free acid of 3-170 points, withdrawing a portion of said operating solution and passing the said portion through a strongly acidic cation exchange resin bed and returning the effluent therefrom to said processing solution, the quantity of said solution passed through said bed being such as to maintain the aluminum concentration in said operating solution in the range of about 0.005% and 0.4% by weight.

Thickness Tester

U. S. Patent 2,967,934. *Jan.* 10, 1961. *P. P. Martinelli, assignor to Commissariat a l'Energie Atomique.*

An X-ray apparatus for measuring the thickness of a deposit formed on a support.

Fused Bath Cleaning

U. S. Patent 2,967,530. *Jan.* 10, 1961. *R. H. Shoemaker and J. A. Faler, assignors to Kolene Corp.*

The method of cleaning metal from surface contamination, such as oxide and scale thereon, comprising providing a molten salt bath containing a substantial quantity of caustic alkali and salts of alkali metals, said bath being divided into a heating and agitation zone, a metal cleaning zone, and a settling zone, said zones being interconnected to provide molten salt circulation therebetween, heating said molten salt in said heating zone sufficient to maintain the salt continuously fluid in each of said zones, immersing the metal to be cleaned in the cleaning zone of said bath, agitating and circulating said molten salt between the heating and cleaning zones to provide sufficiently large turbulent circulation therebetween to prevent settling of suspended insoluble impurities from said molten salt in either of said zones, said settling zone being interconnected at least with the cleaning zone only near the top of the fluid therein to provide restricted circulation therebetween, thus maintaining the molten salt in the settling zone relatively quiescent, and allowing suspended insoluble impurities to settle therein, and removing settled impurities from said settling zone.

Centrifugal Spraying

U. S. Patent 2,967,667. *Jan.* 10, 1961. *E. O. Norris.*

A rotary spray device comprising a stationary housing, a rotary distributor supported by said housing and adapted to eject a spray centrifugally from its entire outer periphery.

Plating Non-Conductors

U. S. Patent 2,968,578. *Jan.* 17, 1961. *J. M. Mochel, assignor to Corning Glass Works.*

In a method of chemically depositing nickel or cobalt on the surface of a silicate glass by chemically etching it, washing it, activating the etched surface by alternately immersing it in an aqueous solution of a catalytic metal selected from the class consisting of Ni, Co and Pd, and then in a solution of a reducing agent, washing it with water and thereafter treating the activated surface with a conventional plating bath containing a salt of the metal to be deposited, hypophosphite ions and a salt of a carboxylic acid, the step in which a submicroporous siliceous film is formed on the chemically etched surface of the glass by exposing the surface of the glass to HF vapor for 5-10 minutes, the temperature of the glass being high enough to prevent condensation of moisture thereon.

Low Gassing Zinc Dust Paint

U. S. Patent 2,968,571. *Jan.* 17, 1961. *W. J. Lantz, assignor to American Smelting and Refining Co.*

A paint composition comprising zinc dust, a vehicle selected from the class consisting of vegetable drying oil paints, phenolic resin paints and alkyd resin paints, tetraethyl orthosilicate in an amount of from about 1.25 to 8.0 per cent based on the vehicle and a neutralizer in an amount to substantially reduce the acid number of the vehicle.

Polishing Aluminum

U. S. Patent 2,968,577. *Jan.* 17, 1961. *W. Helling and H. Neunzig, assignors to Vereinigte Aluminum-Werke Aktiengesellschaft*

In a method of forming a glossy surface on aluminum and aluminum alloys, in the indicated sequence, the steps of treating said body with a pickling solution to remove surface oxide; and wet mechanically polishing said body while the same is substantially free of said surface oxide, whereby a glossy surface is formed thereon.

Immersion Gold Bath

U. S. Patent 2,969,295. *Jan.* 24, 1961. *J. M. Crishal and M. B. Melillo, assignors to Pacific Semiconductors, Inc.*

A method of gold plating the surface of a metallic body which comprises immersing the metallic body in a solution having a pH value in the range from 8 to 10, said solution containing potassium gold cyanide having a gold content of at least 67½% and a soluble alkali metal salt selected from the group consisting essentially of carbonates and bicarbonates.

Conversion Coating

U. S. Patent 2,970,935. *Feb.* 7, 1961. *W. A. Cavanagh, assignor to Parker Rust Proof Co.*

An aqueous solution consisting essentially of about 0.01% to about 0.1% CrO_3 and having a free acid in the range of about 0.05 to about 1.0 and a total acid in the range of 0.5-10.0 and as water is added thereto during use, maintaining the free acidity thereof within the above range by adding thereto an acid selected from the group consisting of chromic acids and phosphoric acids, maintaining the CrO_3 concentration within the above given range by adding thereto at least one hexavalent chromium ion-containing material and operating said rinse within the total acid concentration range of 0.5-10.

Electrolytic Tank

U. S. Patent 2,969,314. *Jan.* 24, 1961. *G. H. Coxe, assignor to Sanford Process Co., Inc.*

Electrolytic apparatus which comprises an electrically conductive tank, a plurality of electrically conductive buttons mounted on and electrically connected directly to the inside walls of said tank, said buttons being spaced from each other, each of said buttons having a plurality of surfaces, at least one of said surfaces being angularly disposed to and intersecting an adjacent surface of said button along a sharp intersecting edge, and an electrical connection to said buttons.

Paint Stripper

U. S. Patent 2,969,328. *Jan.* 24, 1961. *E. Ellenson and R. Galba.*

A liquid composition consisting of methylene chlorobromide and at least one liquid halogenated hydrocarbon having from one to three carbon atoms and at least one halogen atom selected from the group consisting of chlorine and bromine, with the methylene chlorobromide having a ratio of from 5 to 95 parts by volume to 95 to 5 parts by volume of the liquid halogenated hydrocarbon, and sufficient morpholine to give the mixture a pH of 6 to 8.

Spray Gun

U. S. Patent 2,969,926. *Jan.* 31, 1961. *D. J. Peeps, assignor to The DeVilbiss Co.*

A spray gun for the airless spraying of liquid coating materials.

Gas Plating

U. S. Patent 2,970,064. *Jan.* 31, 1961. *W. M. Bolton, assignor to Union Carbide Corp.*

A process for the production of well delineated metallic deposits covering only a surface portion of an object which comprises applying to the ob-

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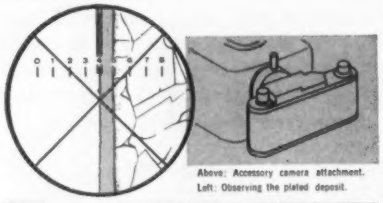

Above: Accessory camera attachment. Left: Observing the plated deposit.

$468 Model PL-MEC complete with all optics and standard accessories	As above with built-in camera attachment, but without 35mm. camera back: $540

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ject a masking agent to delineate on the object the contour of the deposit to be formed, said masking agent comprising a film former consisting of a viscous mass composed of dextran and a glycol vehicle releasable from the film former at temperatures below 500° F., said film former being water dispersible and capable of retaining its water dispersibility when subjected to heat, heating the object in an enclosed vessel to a temperature sufficiently high to decompose a metal-bearing heat decomposable gaseous compound and less than 500° F. to induce volatilization of the vehicle and to create a vapor pressure of the vehicle over the masking agent, passing a heat-decomposable gaseous compound which is decomposable at temperatures above 75° F. and below 500° F. to the object to be plated while the object is maintained at decomposition temperature and while said vehicle is being volatized to thereby deposit on the delineated portion of the object metal while the deposition of metal on the masking agent is inhibited, removing the object from the vessel, and thereafter washing the masking agent from the object.

Plating on Aluminum

U. S. Patent 2,970,090. *Jan.* 31, 1961. *J. C. Withers and P. E. Ritt, Jr., assignors to Melpar, Inc.*

In a method of depositing an electroplate of a nickel group metal upon articles of aluminum and aluminum-base alloys, the steps which include degreasing the articles; rinsing in water; subjecting the article to two etching actions, the first, dipping in hydrofluoric acid, rinsing in water, and the second, dipping in a solution of hydrochloric acid containing manganous sulfate, the total etching time varying from 10 to 80 seconds, rinsing in water; cathodically treating the article in an aqueous nickel bath comprising nickel sulfate, magnesium sulfate, ammonium chloride, and boric acid and subjecting the bath to a current density of circa 15 amperes per square foot for a period of approximately 10 minutes, electrodepositing a layer of nickel on the article and controlling the electrodeposition to produce a thickness which ranges from 0.0001 inch to 0.0005 inch; rinsing in water and then partially drying with an air blast; heat treating the composite plated article at a temperature of about 1000° F. for a period of 2½ to 5 minutes; then removing the light blue oxide that forms thereon during the heat treating step by anodically treating the composite plated article in a solution of sodium hydroxide and sodium carbonate; rinsing in water; subjecting the composite plated article to a reverse current treatment in sulfuric acid; rinsing in water; and thereafter electrically depositing a metal upon the composite plated article other than nickel.

Plating Tube Interiors

U. S. Patent 2,970,950. *Feb.* 7, 1961. *H. J. Bahmann, assignor to Benteler Corp.*

Method of electroplating in continuous operation the inner surface of tubes having impermeable walls and internal diameters down to 3 mm., comprising the steps of passing cathode-connected tubes continuously one after another through bath tanks filled with treatment liquids and at the same time feeding them along an axially arranged stationary anode which they surround, supplying uninterrupted current to the anode during the movement of the tubes through the plant in longitudinal direction, automatically sucking the treatment liquids of the individual bath tanks into the interior of the tubes, pressing it therethrough and, as soon as the rear end of a tube is free, pumping the liquid back into the respective bath tank.

Porcelain Enameling

U. S. Patent 2,971,753. *Feb.* 14, 1961. *F. V. F. Hermans*

A process for removing combined water from porcelain enamels and for vitrifying porcelain enameling material on articles of ferrous metal by fusion of the enameling material in an oven heated by combustion gases comprising introducing said combustion gases into said oven in contact with the enamel-coated articles, circulating the combustion gases at an effective speed by applying a positive pressure to said gases during contact thereof with the enameling material being melted, removing from said oven the combustion gases as they are being circulated, and removing from said oven the combined water contained in the enameling material during the heating of the latter preceding their fusion as the circulated gases are removed from said oven, thereby preventing injurious oxidation of the metal by combined water originally contained in the enameling material.

Plating Powder Compacts

U. S. Patent 2,971,898. *Feb.* 14, 1961. *P. Szeky, I. Nemenyi and T. Eollos, assignors to Altalanos Geptervezo Iroda.*

A process for electroplating ferrous-base molded bodies having a porosity ranging between 10 and 30% manufactured by powder metallurgy, comprising first providing the bodies with a blue oxide layer by treatment with superheated steam, and, after cooling, electrolytically depositing a metal coating on the blue oxide layer.

Continuous Vacuum Metalizing

U. S. Patent 2,972,330. *Feb.* 21, 1961. *W. F. Bugbee, assignor to National Steel Corp.*

In apparatus for vacuum coating a continuously traveling material, said apparatus consisting of a plurality of vacuum chambers, separate means to reduce the pressure in said chambers, means to provide coating vapors within one of said chambers, and means for guiding said substrate over said coating vapors, the improvement which comprises means for providing vacuum seals in the walls of one of said vacuum chambers to allow passage of said substrate into and out of said vacuum chamber, said vacuum seals comprising a roller and a close-fitting housing for said roller, the opening between said roller and housing being not wider than 0.050 inch, said substrate following an arcuate path around said roller, said path describing an arc of between 120 and 180 degrees, and means for holding the substrate taut against said roller in order that contact between the substrate and the housing be prevented.

Nylon Coating Method

U. S. Patent 2,972,553. *Feb.* 21, 1961. *P. S. Hess, assignor to General Plastics Corp.*

A method of coating surfaces of solids which remain solids above the boiling temperature of water with nylon including the steps of heating the surface to a temperature above the boiling point of water and below 400°F., spraying a finely divided aqueous dispersion of nylon on said surface and maintaining the temperature of the surface above the boiling point of water during the spraying step, the temperature at which said surfaces are maintained being sufficiently high to flash off substantially all of the water from the aqueous dispersion and deposit a tough, adhering, homogeneous film of nylon thereon.

Coating Thickness Tester

U. S. Patent 2,972,882. *Feb.* 28, 1961. *W. S. Erwin, assignor to General Motors Corp.*

An apparatus for thermoelectrically measuring the thickness of a metallic coating on a basis metal, said apparatus comprising a first metallic probe member having a convexly curved contact end, a second metallic probe member having a convexly curved contact end, both of said probes being of metal forming thermoelectric junctions with said metallic coating, an electrical resistance heater surrounding said first probe for heating it to a predetermined temperature, a heat shield between said probes and an electrical indicating device connected in series with said probe members to indicate a differential E.M.F. generated upon contact of said probe members with a metallic surface.

Washing Machine

U. S. Patent 2,972,995. *Feb.* 28, 1961. *E. Umbricht and D. Evans, assignors to AJEM Laboratories.*

A parts washer comprising means defining a parts receiving position and means defining a parts delivery position and a continuous chain conveyor extending between said positions.

Electrolytic Polishing Apparatus

U. S. Patent 2,973,311. *Feb.* 28, 1961. *T. R. Brunson and H. G. Davis, assignors to Rocky Mountain Metal Products Co.*

An electrolytic polishing instrument comprising a substantially closed hollow housing having spaced top and lower walls with side wall means extending therebetween, a liquid impervious shallow trough extending between the side wall means adjacent but spaced from the upper end thereof, said trough being substantially coextensive with the top wall and comprising a solid base substantially parallel with the top wall but spaced therebeneath the substantial depth of the trough, at least one opening in said top wall, and a removably positioned cup for liquid supported by said base at said opening to extend from said trough through the opening, the cup being provided with a portion depending from the cup base, said trough base having a projection provided with a sleeve within which said portion is detachably secured.

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Starts at 2:00 p.m. Monday, June 19th. All-day symposium on Finishing Light Metals Tuesday, June 20th; morning sessions on Wednesday and all day on Thursday. Complete list of technical papers will be found on pages 96 and 97 of our February issue.

Plant Visitations:
Keystone Camera Co., Massachusetts Institute of Technology, Gillette Safety Razor Co., Western Electric Co., and Raytheon Manufacturing Co.

Social Program Highlights:
Sunday — Ladies Tea, Evening Get-Together Party
Monday — Metal Finishing Suppliers' Association Party and Buffet Supper
Tuesday — Boston Pops Concert
Wednesday — Outing and clambake at Pilgrim Village
Thursday — Annual Banquet

Registration:
Adults — $25 per person including Banquet, Outing with clambake, and Boston Pops Concert.
Children — $15 each including sight-seeing and clambake. Banquet $8.50 extra, Pops concert $1.50.

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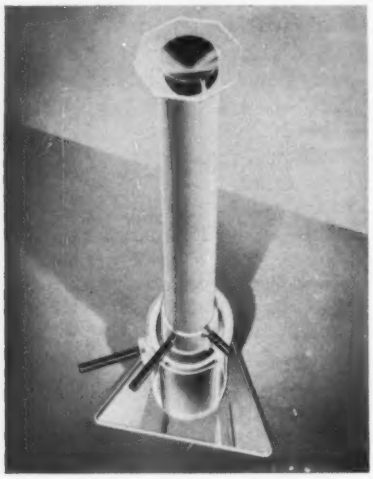
RECENT DEVELOPMENTS

NEW

METHODS, MATERIALS AND EQUIPMENT FOR METAL FINISHING INDUSTRIES

Salt-Fog Dispersion Tower

G-S Equip. Co., Dept. MF, 15583 Brookpark Road, Cleveland 35, Ohio.



The Uni-Fog Tower makes it possible accurately to control collection rates on samples in salt fog test cabinets, thus insuring uniformity of all tests. This uniformity is not restricted to repeat tests in one cabinet, but is also accomplished in widely separated locations and in various types of cabinets.

The unit is designed for simple installation and provides high operating efficiency in any ASTM-approved test cabinet.

Continuous Spiral Buff

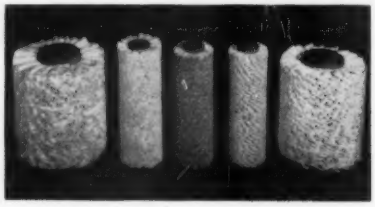
Geo. R. Churchill Co., Inc., Dept. MF, 17 Churchill Rd., Hingham, Mass.

The Spyri-Roll buff is made from one continuous strip of buffing element or material, which can be either the finger type or the standard bias type, either cloth or sisal and in various densities, as desired.

The continuous spiral construction provides the unusual and decided advantage of performing a double cutting action by the buffing element. The buffing element rotated against the work provides one cutting action while its sideways movement, due to its spiral or helical construction, provides the second cutting action.

The buff is provided in cartridge form ready for immediate use, and keyways are provided for mounting on the shaft to prevent slipping. Thus, it eliminates all streaking of the work and gives a much higher degree of production due to the double cutting action, inherent in its construction, it is claimed. Another advantage is that, since the buff cartridge is finished, ready for mounting, 75% of set-up time is saved. Furthermore, no special equipment is needed for mounting on arbors and the buffs can be sent directly to the finishing room from the receiving platform.

The buff is particularly adaptable for use on machines where the work traverses the face of the buff. The bias type is excellent for flat polishing of sheet work. The cartridges themselves are refillable. Buffs are available in soft, medium, and hard densities. The densities are controlled by the amount



of the material per helix and the spacing between the helixes, besides the type of material used in the buffing element structure itself. The buff cartridges come ready for immediate use in various widths up to 45″ and in 41″ to 20″ diameters.

Copper Oxide Remover for Printed Circuits

Meaker Co., Sub. Sel-Rex Corp., Dept. MF, Nutley, N. J.

Electroplating on to copper and copper alloy printed circuits is said to be substantially improved by Deoxyde which, reportedly, removes oxides, oils, fingermarks, and similar plating deterrents, through a simple dipping operation.

According to the manufacturer, the new formulation cleans without affecting plating resists, or etching copper circuits, thus promoting reject-free production of subsequent electroplating operations.

The material is packaged in a specially-designed polyethlene "cubitainer," from which it is easily poured to mix with equal parts of water in a suitable processing vessel. Printed circuits are said to be effectively cleaned by dipping for 30 seconds to 5 minutes, depending on size and configuration of circuit design.

Multi-Color, Spray-On Vinyl Finishes

Coatings Div., Metal & Thermit Corp., Dept. MF, Rahway, N. J.

New multi-color, spray-on vinyl finishes for a wide variety of consumer, architectural, and industrial products have been announced by the above manufacturer. In a two-step system, decorative vinyl finishes in unlimited color and with controllable texture can be applied to either phosphated steel or aluminum by conventional or electrostatic spray techniques.

The new system permits application of a tough, multi-colored vinyl finish to products after fabrication, producing savings over methods which start with pre-laminated or pre-coated sheet metal. Since forming and welding are done before the finish is applied, no

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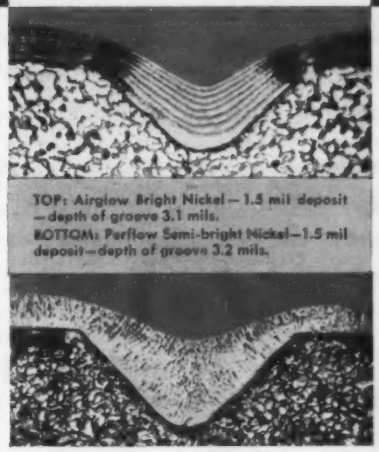
Gives you insurance against air supply failure because it operates efficiently with any agitation system.

Airglow allows the use of current densities much higher than attainable from mechanically agitated systems.

Levelling effects of Harshaw Airglow Bright Nickel deposit compared to that of Harshaw Perflow leveling semi-bright nickel.



TOP: Airglow Bright Nickel—1.5 mil deposit—depth of groove 3.1 mils.
BOTTOM: Perflow Semi-bright Nickel—1.5 mil deposit—depth of groove 3.2 mils.

- Airglow depth of color and brightness unequalled.
- Airglow corrosion resistance—the best of any bright nickel.
- Airglow gives levelling comparable to Perflow levelling!
- Airglow gives economies unusual for bright nickel.

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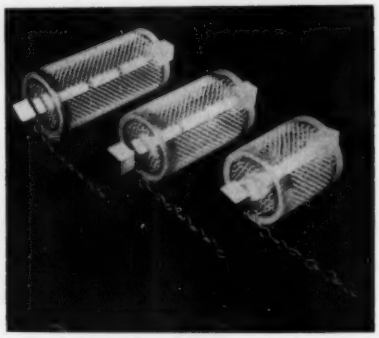
special care is required in fabrication. And, the finish can be applied in the fabricator's own shop with conventional equipment. Inventory problems are greatly simplified, since only the actual uncoated metal need be stocked. The different colors and textures are obtained merely by changing the vinyl spray material. And, coated rejects can be stripped and resprayed. Since production scrap is generated prior to coating, no vinyl material is lost and the scrap metal has full value.

In application, a wet film base coat of the desired undertone color is developed with three or four spray passes on the part to be coated. Immediately following this, and while the part is still wet, three or four spray passes of topcoat are applied. Color texture begins to form almost immediately on this second application, and continues to form during the specified 15- to 30-minute flash off period. The normal bake schedule calls for five minutes at 200-250°F., followed by fifteen minutes at 300-325°F. Texture is a function of viscosity and wetness of base and topcoats, which can be controlled within close limits.

Small Lot Plater

National Plastics & Plating Supply Co., Dept. MF, Box 34, Terryville, Conn.



The Mitey-Mite plater is claimed to be the only one of its kind. Small loads are no longer a problem—just load the plater and place in the barrel. Contact is made through the work load, into a small dangler, and into the plater. Its quick load and unload features are an essential, according to the manufacturer. The platers can be ordered in sets of three, or a single unit, sizes 6", 4½" and 3".

Ventilated Buff

Divine Bros. Co., Dept. MF, 202 Seward Ave., Utica, N. Y.

A three-inch ventilated metal center

bias-type buff is available with either permanent or removable centers. Each Red-D-Vent Buff incorporates a one-piece flat internal steel binder ring for added safety in use. The binder ring locks the cloth in place and eliminates the need for jagged fastening ring teeth.

Standard cloth grades in which the three-inch center buff is offered include 64/68 — 3.15 wt., 80/92 — 3.50 wt., 86/93 — 2.50 wt. and 86/93 yellow treated. Many other grades, including flannels, are available on special order.

Buffs of types 0 to 6, inclusive, are regularly furnished in the small size, others as specials. Buff diameters range from 8″ to 15″.

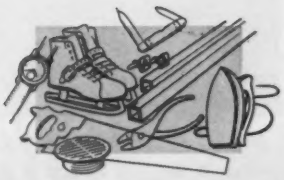
Nickel Stripper

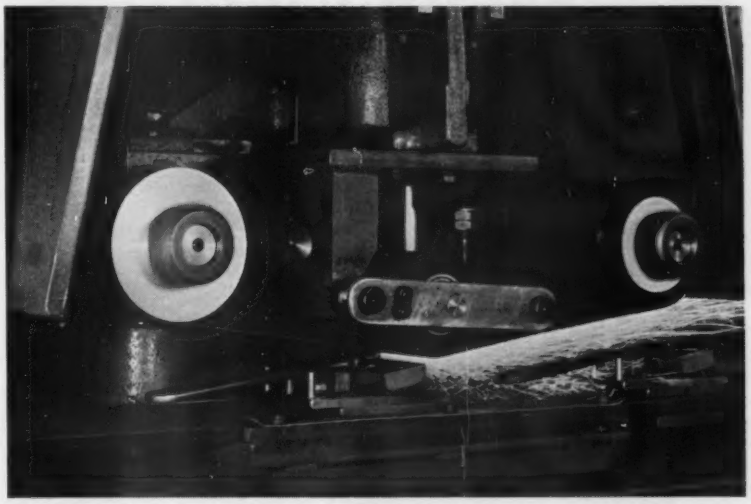
Enthone, Inc., Dept. MF, 442 Elm St., New Haven 8, Conn.

A nickel stripper which does not attack steel, copper, brass, or solder, Enstrip NP can be used to strip nickel from steel, nickel from copper and brass, or nickel from assemblies made up of combinations of steel, copper, and brass components. It dissolves nickel by simple immersion at room temperature; elevated temperatures may be used for faster stripping. The stripping solution does not contain cyanides, is non-fuming and presents no cyanide waste disposal problem. It is a stable solution which does not decompose when left idle for long periods of time.

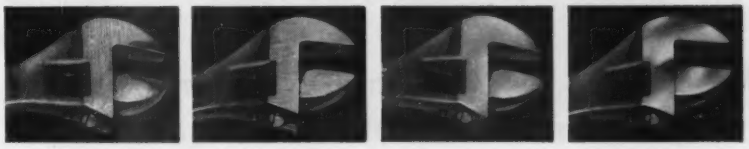
The product is furnished as two liquid concentrates. NP-1 and NP-2, which are mixed together with water to make up the stripping solution. The solution may be contained in a plain steel tank or drum. At 175°F., it will remove nickel plate at a rate of 0.003″/hr.

ACME IN ACTION





Progressive Finishing—Flat broached forgings ground, polished and buffed on an Acme Automatic Multiple-Head Machine.



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Designing and building versatile finishing machines that do more work—better, faster, easier, and at lower cost—is a specialty at Acme. Has been, too, for over half a century.

Take the multiple-head flat surface finishing machine shown close-up in action above. It consists of standard Acme components, yet it can be used to perform a number of operations on a wide variety of parts. Deburr, grind, polish—buff or satin finish. All done automatically—in a single pass if desired. What's more, oscillating movement of the conveyor in motion prolongs useful life of abrasive belts and buffing wheels—assures greater uniformity of finish on every piece.

Range of models? Light and heavy duty machines—conveyor belt or pinch roll fed—available in sizes to accommodate your flat parts and products up to 74 inches in width!

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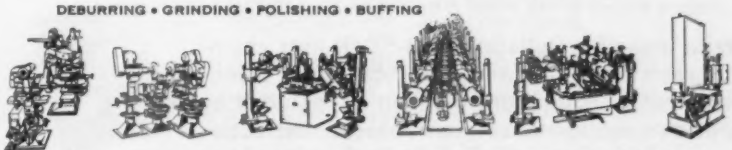

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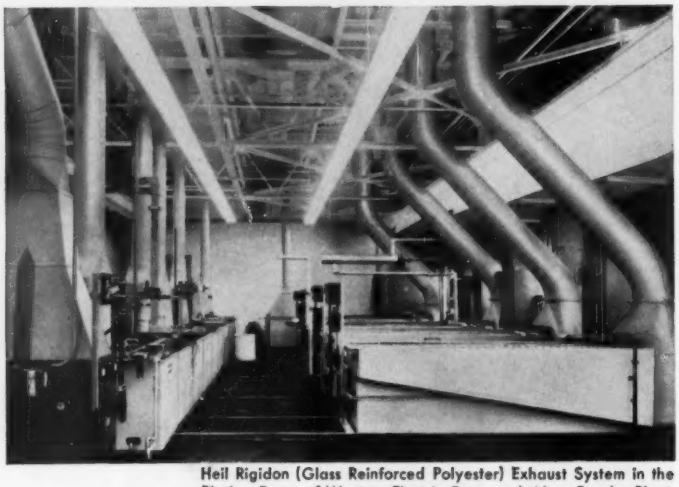
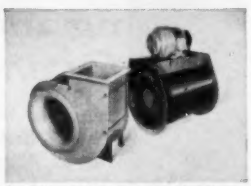
PLASTIC VENTILATING SYSTEM at *Western Electric* plant



Heil Rigidon (Glass Reinforced Polyester) Exhaust System in the Plating Room of Western Electric Company's New Omaha Plant.

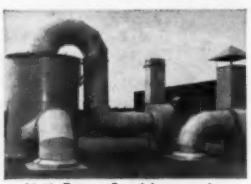
features attractive appearance, high strength, long life, easy installation and complete corrosion resistance

Western Electric Engineers wrote the specifications. The ventilating system for their plating room must look as modern and attractive as all other parts of their new plant. The system must positively resist exposure to fumes and the splash of acids and alkalies. It must be sturdy and rigid; and combine long life, low maintenance, be easy to install or re-arrange, and low in first cost. The Heil Rigidon system pictured above met all these requirements.



Heil Centrifugal and Axial Rigidon Reinforced Plastic Fans.

In your plant also, Heil service-proved plastic ventilating equipment will definitely cut the costs of handling corrosive fumes. Complete line, including collecting hoods, ducts, fans, stacks and fume scrubbers in Rigidon (reinforced plastic) or Rigivin (rigid vinyl) construction. Wide range of standard sizes speeds delivery and minimizes engineering costs.



Heil Fume Scrubber and Rigidon Duct Work.

Write today for Bulletin No. B-500. It lists chemical resistance data and specifications of standard sizes of equipment that can be installed by your own maintenance men or local contractor.

CHEMICAL-PROOF LININGS · TANKS HEATERS PLASTICS

HEIL PROCESS EQUIPMENT

CORPORATION

12914 Elmwood Ave. • Cleveland 11, Ohio

Nickel Activator

Frederick Gumm Chem. Co., Dept. MF, 538 Forest St., Kearny, N. J.

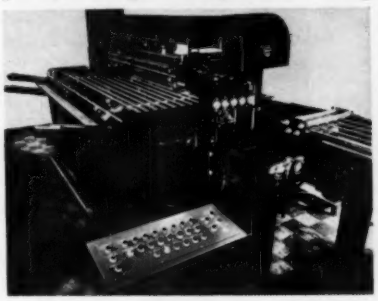
Nickel plated parts can now be activated prior to chrome plating by using Clepo 199-R. Clean waterbreak-free parts are immersed for 15-20 seconds in a dilute sulfuric acid solution to which is added 4-8 oz./gal. After rinsing, the parts are ready for chrome plating. The prepared solution insures more complete chrome coverage and also improves the throwing power of the chrome solution by activating normally passive areas of nickel deposits. This simple operation can be closely controlled to insure uniformity in its action.

Internal Tube Painter

Spraymation, Inc., Dept. MF, 25 Amity St., Little Falls, N. J.

Spraymation Model C-18 Conduit Interior Coating Machine applies lacquers, enamels, waxes and similar materials to the interior of pipe and conduit. The machine shown is painting 10 foot lengths of ½ through 4 inch conduit. Speeds of up to 60 pieces per min. are obtainable for smaller sizes.

Fully automatic, the machine receives conduit in a hopper, positions it and checks for correct length and location, clamps and shields it before spraying, and runs spray lances completely through each piece of tubing



so that a complete, accurate coverage can be obtained. The machine uses hydraulic, pneumatic, and electrical equipment for indexing and checking.

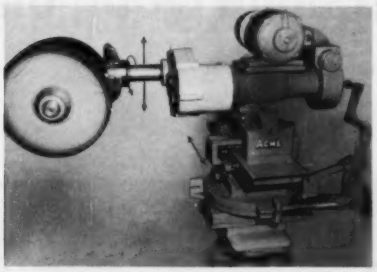
Vertical Oscillating Buffing Attachment

Acme Mfg. Co., Dept. MF, 1400 E. Nine Mile Road, Detroit 20, Mich.

A new vertical oscillating attachment can be easily installed on Acme semi-automatic buffing machines to permit "mush" or "slough" buffing operations on recessed and contoured parts.

Mounted directly to the main

spindle housing, the oscillating attachment simultaneously rotates the part and moves it vertically above and below the center height of the buffing wheel to provide a greater part contact area.



The maximum vertical stroke of the attachment is 6 inches and is adjustable to meet specific finishing applications. The attachment is driven by an eccentric gear mechanism. It can be used with vacuum chucking arrangements.

Dyes for Anodized Aluminum

Carbic-Hoechst Corp., Dept. MF, 270 Sheffield St., Mountainside, N. J.

Five new aluminum dyestuffs for anodized aluminum are homogeneous products, have a very good to excellent fastness to light and are especially manufactured for use in the anodizing industry. The new aluminum dyestuffs are: Aluminum Black LCR, Aluminum Fast Grey 3LW, Aluminum Green LWN, Aluminum Blue RL and Orminal N.

Waste Treatment Package

Industrial Filter & Pump Mfg. Co., Dept. MF, 5900 Ogden Ave., Cicero, Ill.

A five-pronged start-to-finish package is the "heart" of what is claimed to be the most complete waste treatment service available anywhere. The service is called the "800 Series Inorganic Waste Treatment Program" and covers everything from original diagnosis to final disposal. It offers complete waste treatment systems including liquid/solid separation by gravity or pressure filtration and treatment of such solutions as acid, alkali, cyanide, chrome and oil.

The complete program, it was stated, includes these related phases:

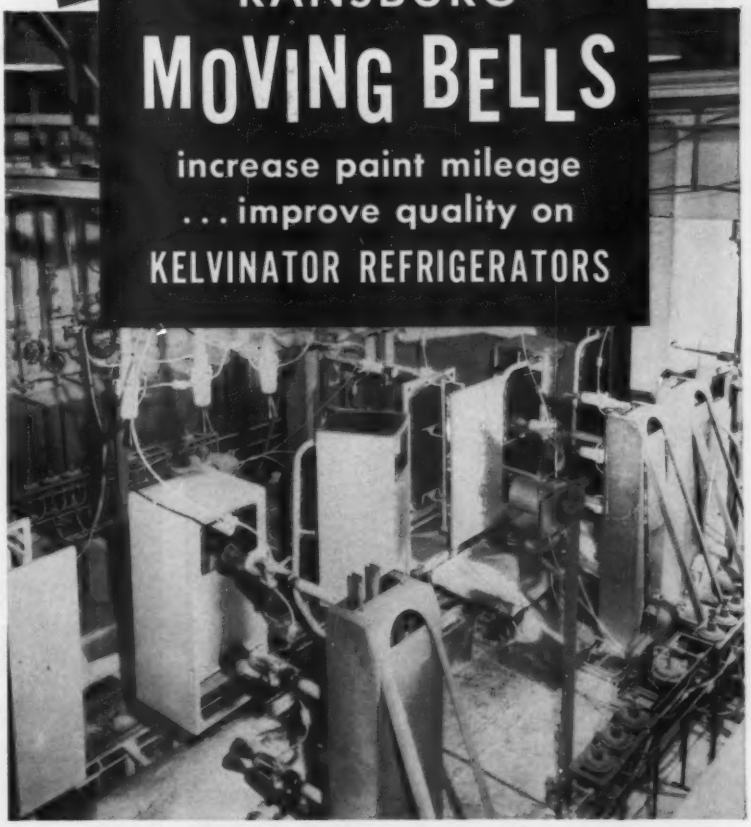
1. Preliminary survey service.
2. Pre-designed package plants.
3. Compact custom designed plants.
4. Installation service.
5. Continuing monitor service.

NEW

RANSBURG

MOVING BELLS

increase paint mileage ... improve quality on KELVINATOR REFRIGERATORS



Ransburg's No. 2 Process moving bells—latest innovation in electrostatic painting—automatically paint mixed sizes of refrigerator cabinets and doors on Kelvinator's new finishing line.

On this job—first of its kind—limit switches re-position the reciprocating bells to accommodate various model sizes mixed on the same line. And, electric eyes selectively trigger the paint on and off between parts.

RESULTS? Automatic electrostatic spray painting—which replaced a battery of reciprocating automatic air guns—is providing Kelvinator with a beautiful, higher quality, and more uniform finish. Rejects, formerly a troublesome problem, have been practically eliminated. And, along with appreciable labor savings in this highly automated set-up, paint mileage is substantially improved . . . even bettering the savings indicated in pre-installation lab tests at Ransburg.

Like Kelvinator, other manufacturers of quality products will find Ransburg's moving bells the automation answer for production lines where batching of similar parts is impractical.

NO REASON WHY YOU CAN'T DO IT, TOO!

Want to know how Ransburg No. 2 Process can improve the quality of YOUR painted products—and at the same time—cut YOUR paint and labor costs? Write for our No. 2 Process brochure. Or, if your production doesn't justify automatic painting, let us tell you about the No. 2 Process Electrostatic Hand Gun which can be used in either conveyorized, or non-conveyorized painting.

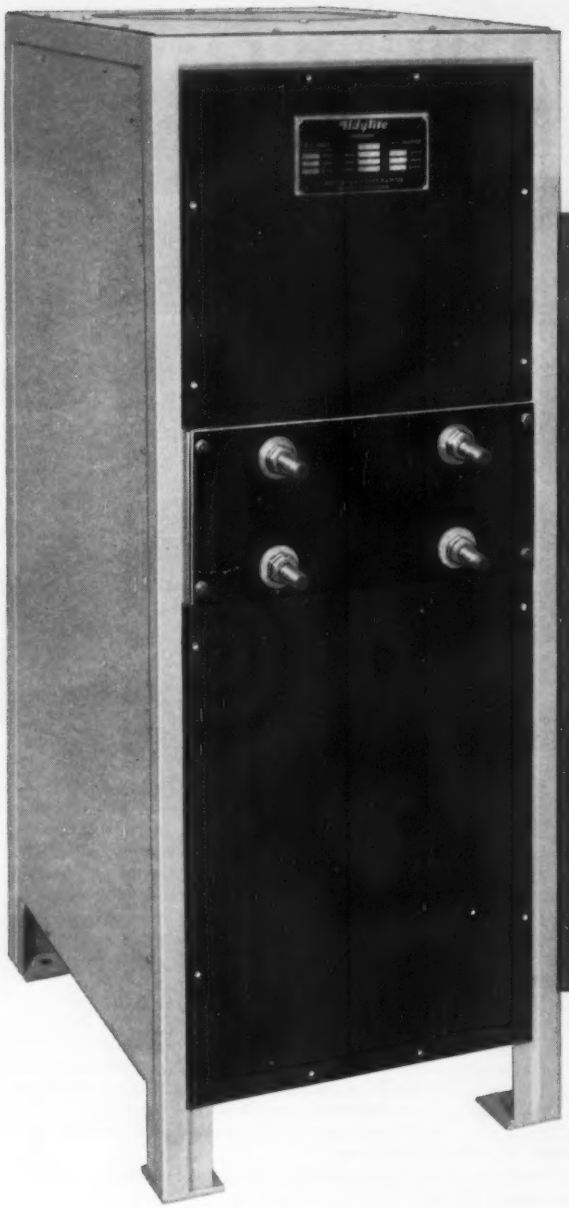
RANSBURG

RANSBURG Electro-Coating Corp.

Box 23122, Indianapolis 23, Indiana

Take advantage of the NEW PROJECT ALERT

. . . rebuild your old



Give your old rectifiers new silicon efficiency, new ruggedness, new long life at a NEW, LOW COST!

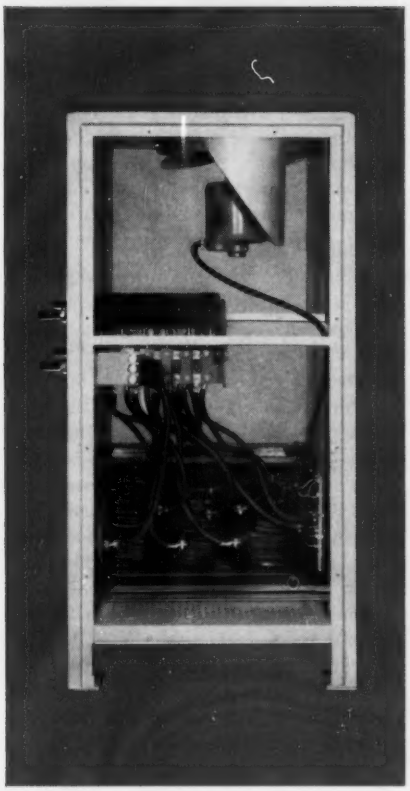
Udylite

WORLD'S LARGEST PLATING SUPPLIER

RECTIFIER PROGRAM

equipment now!

PROJECT ALERT



Now's the right time to let Udylite electrical equipment specialists rebuild your old, inefficient, 6-, 9- and 12-volt UM and UV rectifiers. You can obtain all of the advantages of a completely new silicon unit at a cost just slightly more than a silicon diode replacement kit. With the exception of the transformer, you'll have *a brand new rectifier from top to bottom* for greatly improved plating efficiency and extra-long service life.

NEW, MODERN CABINET in an attractive, two-tone, rust-resistant finish features slotted side panels for easy removal and replacement.

UNIFRAME CONSTRUCTION gives increased ruggedness, reduces overall weight.

NEW DIODE ASSEMBLY has newly-designed, one-piece, solid copper, finned heat sink and improved, non-aging silicon diodes with ceramic insulation and individual fuse protection.

NEW VENTILATION SYSTEM with new fan-housing assembly and permanent, built-in baffling assures highest ventilation efficiency.

NEW, LOW HEIGHT saves space. D.C. terminals are located in same relative position, thus new bussing is not required for re-installation.

All transformers are full-load tested before and after re-manufacturing. They are re-varnished and provided with new insulation on secondary leads. The Udylite Project Alert factory conversion program is designed to boost the efficiency of all your old UM and UV Rectifiers at a new, low cost. It will pay you to investigate its many benefits today. For factory conversion of other old-style Udylite Rectifiers to economical silicon units, contact your local Udylite Representative.

Silicon Conversion Kits

Udylite Silicon Diode Kits are also available for UV and UM rectifier conversion right in your plant. A specially fabricated heat sink assembly, complete with diodes and fuses, permits fast, easy installation.

THE UDYLITE CORPORATION • DETROIT 11, MICHIGAN

udylite

Once you use it you'll Order... Again... and Again... and Again!

Every can filled with a full weight of extra high quality 99.75+% Chromic Acid. Prompt delivery made from ample factory and nearby distributor stocks.

BETTER FINISHES & COATINGS, INC.
268 Doremus Avenue, Newark 5, N. J. · 2014 East 15th St., Los Angeles 21, Calif.

Metal Cleaner Conditioner

Turco Products, Inc., Dept. MF, 24600 S. Main St., Wilmington, Cal.

Turco W. O. #1 is specifically designed to simplify the pre-paint treatment of metal surfaces. It cleans, passivates, and removes corrosion, all in one step. The product is claimed to remove and prevent light oxides and corrosion quickly and easily, and in the same operation produces a slightly porous surface which absorbs primer, providing a firm base for paint. It may be applied by immersion, brushing, spraying, or swabbing. It is a fast and efficient rust remover, removing rust not only from metal surfaces but also from screw heads, grooves and crevices. It contains no abrasives — rust disappears without sanding or scouring.

Semi-Automatic Power Brushing Machine

Osborn Mfg. Co., Dept. MF, 5401 Hamilton Ave., Cleveland, Ohio.

A new finishing machine consists of a two spindle indexing workholder, and one universal finishing wheel head. Simplicity of design makes the 5224-M1A ideal for job shop or continuous production runs. The two spindle workholder makes for inexpensive fixturing, while the M1A finishing head is engineered for extreme versatility. Major setup adjustments are built in to

achieve any compound angle for positioning of the finishing wheel.

During high production runs, the operator performs the unload and load operation on one spindle, while the gear or part on the other spindle is being deburred or finished.

Agitated Cleaning Unit

Equipment Div., Magnus Chem. Co., Inc., Dept. MF, Garwood, N. J.

Porto Lif "tramway" for all multi-tank cleaning is a low-cost, 75 pound capacity, lever controlled, pneumatically operated unit that provides 100 to 140 up-and-down motions per minute in the cleaning solution. In operation, the work is loaded onto the platform, pneumatically raised, and then manually rolled into position over the first tank. A flick of the lever lowers the platform into the tank of cleaning solution and automatically starts the agitation. At the end of the cleaning period, the platform is raised from the solution and the unit rolled into position over the next tank for an agitated rinse.

The unit shown is for two stages; wash and rinse. It can be adopted to perform any number of operations such as pre-wash, wash, rinse, anti-rust and dry. The unit can be purchased to be used with existing tanks, or as a complete unit including desired number of tanks. It is also available for mounting on 30 and 55 gallon drums.

Electrocleaner

Diversey Corp., Dept. MF, 1820 W. Roscoe St., Chicago 13, Ill.

A new electrocleaner, specially formulated to eliminate smut problems and provide effective cleaning action on problem soils, No. 1107 is intended primarily for ferrous metals but is also

highly effective on copper and brass. The manufacturer reports that the cleaner rapidly removes and thoroughly emulsifies contamination. Its powerful cleaning action leaves metal surfaces smut-free and chemically prepared for plating.

The exceptionally high conductivity reduces current requirements and processing time, the product's foam characteristics control fuming, solution spray and hydrogen explosions, and its water softening action provides maximum scale control in the tank and prevents hard water film on the surface being treated.

Cadmium Bright Dip

Conversion Chem. Co., Dept. MF, Rockville, Conn.

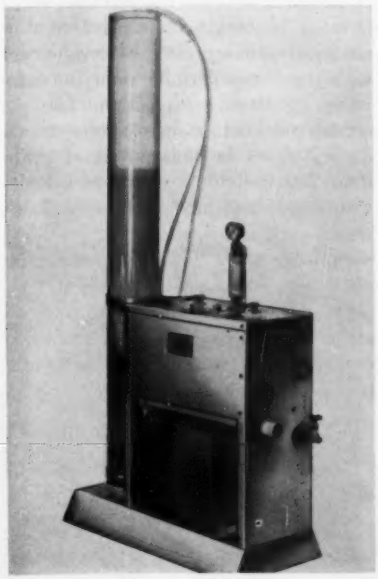
Kenvert No. 26, to be used for brightening and corrosion protection of cadmium plate in a single dip, is claimed to be the first single dip for cadmium which offers economy, free rinsing, and corrosion protection. As a result the product can be used for bulk treatment of cadmium in a horizontal plating barrel, and will produce bright work without staining in the rinsing operation.

Because the solution is so dilute, waste disposal is not a problem, the bath operates at room temperature, and no ventilation is required.

Demineralizers with Lucite Columns

Barnstead Still & Sterilizer Co., Dept. MF, 307 Lanesville Terrace, Boston 31, Mass.

The use of Lucite columns in the above manufacturer's line of industrial demineralizers up to 150 gallons per hour permits the operator to observe the backwashing operation and watch the condition of the resins at all times.



The manufacturer believes that this is the first time that transparent Lucite exchange columns have been used in industrial two-bed type demineralizers.

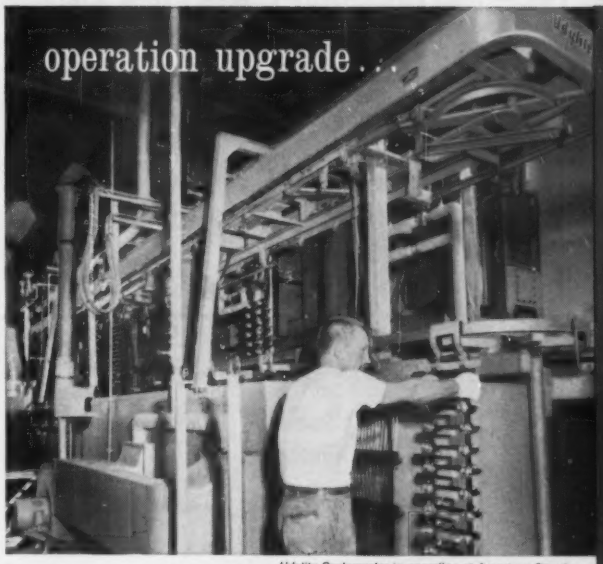
Floor Joint Filler

Corrosion Engineering Prod. Dept., Pennsalt Chemicals Corp., Dept. MF, Natrona, Pa.

A chemically resistant joint filler with a high degree of load bearing ability, Flexjoint bonds to both concrete and brick surfaces with greater strength, greater than the materials it joins. It is an expansion-contraction filler which remains flexible over a wide useful temperature range.

The new joint filler, resistant to a wide variety of chemicals, is a two-component resin system formulated in both a pouring grade and a caulking grade. The pouring grade cures rapidly into a stiff contraction-expansion joint material. The caulking grade can be used as a strongly bonded sealout, caulking material or expansion joint for metal, concrete, stone, masonry or wood.

Components can be mixed readily without special equipment. Application is easy. The pouring grade is fluid and fills cracks and joints without slump in



Udylite Cyclemaster in operation at American Standard Plumbing and Heating Division, Cincinnati, Ohio

udylite

CYCLEMASTER has the answer

This Udylite Cyclemaster, which is another way to say low cost automation, represents six important areas of improvement in American Standard's plating production.

- quality control to meet their most exacting top standards
- production volume far exceeding their expectations
- nearly 50% savings in floor space used for the operation
- almost total elimination of rejected pieces
- ultra-sonic cleaning to eliminate complicated de-greasing
- Plastisol coated tanks for minimum maintenance . . . long life

Learn how Cyclemaster can perform with equally promising revisions of your profit picture while improving your product whatever it may be. To find out how so *much* can be accomplished for so *little*, ask your Udylite representative, today!

Udylite

The Udylite Corporation
Detroit 11, Michigan

How Pure Need Your Silver Anodes Be?

HANDY & HARMAN MAKES THEM 999+ OR FINER IF YOU SPECIFY

For general commercial work, Handy & Harman anodes are 999+ fine. And it makes no difference in what shape or size they're made: ball, rod, plate, strip or sheet, they all have the same uniformly high degree of purity. What's more, if you want still finer anodes, you can specify the AA grade for high-speed plating, or finer, if desired. Handy & Harman supplies them all.

Your "fineness need" is our first concern. You can be sure that you'll get *exactly* what you want in anodes from Handy & Harman... thousands of manufacturers will agree.

MANY HAPPY RETURNS

Handy & Harman Refining Service has reached a state of perfection that assures you —in lot after lot—of *accurate* returns. Your anode ends, plating solutions, precious metal scrap, sweeps and waste are more *rewardingly handled* by Handy & Harman.

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General Offices: 850 Third Ave., New York 22, N. Y.

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Ship Refinings to the nearest of these plants

EAST COAST			WEST COAST	CENTRAL U. S.
850 Third Ave. New York 22, N. Y.	Bridgeport 1, Conn.	425 Richmond St. Providence 3, R. I.	330 N. Gibson Rd. El Monte (Los Angeles), Calif.	1900 W. Kinzie St. Chicago 22, Ill.

the joint. Rapid setting and cure helps speed construction work. It is resistant to alkalies and solvents. It will also resist mild acid attack.

The filler has a pot life of 25 minutes after mixing. It sets in three hours and cures in 24. Its shelf life is indefinite, and it is available in either black or gray.

Aluminum Etch

Chemclean Products Corp., Dept. MF, 15-08 121st St., College Point 56, N. Y.

#911-F is a new non-sludging aluminum etch, which will eliminate the irritating spray-up of alkali which is prevalent when using alkalies for aluminum etching. The etch can be used in enclosed areas without the need for costly exhaust systems.

The product is an alkaline powder used at 4 to 8 oz./gal. of water at a temperature of 140-180°F. It also eliminates sludging of aluminum oxide on the walls and steam coils of the operating tank, thereby saving time and labor on equipment maintenance, and it leaves the surface of the treated aluminum with a white, finely grained etched surface.

Aluminum Bright Dip Replenisher

Technical Processes Div., Colonial Alloys Co., Dept. MF, Philadelphia 29, Pa.

A simple control method has been evolved which does not employ chemical analyses or instrumentation. A single solution of bath ingredients replenishes the bath from time to time. This new control method, which takes about 2 or 3 minutes, may be checked by a non-technical worker, in an automatic or manually operated bath. A chemical neutralizes nitric oxide fumes.

Ultrasonic Cleaning Unit

Blackstone Corp., Dept. MF, 1111 Allen St., Jamestown, N. Y.

The SG-3 Ultrasonic System is available with standard interchangeable tanks of 4, 5 and 8 gallon capacity. If increased sonic power density is desired, smaller 1, 2 and 3 gallon tanks are also available from stock. Extra tanks may be purchased separately and used interchangeably on this flexible multi-purpose equipment.

The tank lifts off the stainless steel-covered housing without interrupting electrical connections. Low-level drain with screw cap permits emptying tank while in operating position. The exclusive patented magnetostrictive transducer, which is constructed of more than 200 individual tough nickel elements, will not heat processing fluids when work is being done at low temperatures, and provides maximum sonic output even with fluids at temperatures up to 400°F. A recessed etched control panel features simplified controls and built-in timer to assure processing accuracy.

Water-Wash Spray Booths

Despatch Oven Co., Dept. MF, 619 S.E. Eighth St., Minneapolis 14, Minn.

Thrift-Flow, a new line of economy water-wash paint spray booths design-

ed to give production-line economy and efficiency on short runs, uses nozzle sprays with overlapping patterns to achieve high-speed removal of paint pigments and volatiles. Panel-type construction and other features found previously only on more expensive equipment are incorporated in the line.

Use of these booths will allow small and medium sized finishing departments production facilities comparable to those of large operations. They are available in a variety of sizes, and with optional explosion-proof motors, motor starters, float valves, lights, conveyors, and exhaust stacks.

Water-Based Lacquers

Bee Chem. Co., Dept. MF, 2700 E. 170th St., Lansing, Ill.

Lacqua M-802 and M-804 are said to equal the properties of quality lacquers and enamels without the fire hazards encountered with these materials. The products are applied by dipping and, it is claimed, are easier to handle than lacquers yet afford comparable protection for all plated and bare metals.

M-802 is a clear coating designed for metal finishers who utilize force-drying for coated parts. It can be cured as low as 140°F. to 150°F. for 10 minutes or as high as 275°F. for 7 minutes. M-804 is applicable to baking systems and is fast curing. It will fully cure in 15 minutes at 275°F.

Vapor Degreaser

Beta Engineering Co., Dept. MF, 2924 Quenby Rd., Houston 5, Tex.

An air-cooled vapor degreaser is electrically heated by 115v. AC power and requires no water or drain piping. It is constructed of cast aluminum and, weighing only 25 lbs., is easily portable for use around the entire plant.

Using trichlorethylene solvent, the simple process of vaporizing and condensing in the cooling zone assures constant degreasing with freshly distilled solvent. Dirty parts are cleaned and dried in minutes ready for buffing, plating, painting or assembly operations.

On special request the unit may be factory-set to use Freon "BF" or "TF" solvents.

Anti-Corrosion Coating

Met-Con Laboratories, Dept. MF, Box 7103, Houston 8, Tex.

A new all-purpose furan resin coating for interior and exterior metal application, called Permaspray, is offered in a wide variety of colors for product finishing or maintenance coating.

This thermosetting coating is suitable for brush, dip, or spray applications. The resulting finish, which cures at room temperature, provides a hard (Moh 4) but tough, flexible film with exceptional resistance to corrosion, abrasion, and most chemicals.

Fluorescent Gloss Enamel

Advance Process Supply Co., Dept. MF, 2315 W. Huron St., Chicago, Ill.

Lumi-Glo weatherproof gloss enamel fluorescent, Type DE, mild solvent type, is a superbly flexible, scuff-resistant, brilliant high gloss fluorescent color with excellent screenability on wood, glass, metal and some plastics. It is excellent for decal processing, screens through fine meshes without clogging, and dries overnight.

ZERO-MIST
world's largest plating supplier
udylite
they're both money to platers
ZERO-MIST
Zero-Mist can mean cost savings for you.
There is sound reason for the steady increase in the use of Udylite Zero-Mist over the past six years. Users everywhere have learned that here is the one mist suppressant that actually does what it's supposed to do.
With Zero-Mist you immediately add cash savings to your budget. Here are the six different ways costs conscious platers effect substantial operating economies with Udylite Zero-Mist.
• Eliminate completely the health hazard of dangerous chromic acid mist . . . it beats the most stringent code limitations.
• Save expense of chromic acid loss from mist and drag-out.
• Avoid permeating the outside air with destructive fumes.
• Eliminate contamination of adjacent baths.
• Sharply reduce costly waste disposal.
• Reduce equipment maintenance.
the udylite corporation
Before you invest in expensive air wash ventilation and blower equipment, ask your Udylite man what Zero-Mist can do for you.
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THE
MAGNUS
METHOD
FOR CLEANING AND FINISHING
LIGHT METALS
Magnus methods, utilizing specialized compounds and equipment specifically designed for the light metals industry, have produced results such as these:

"SPRAY WASHING COSTS CUT $3,500 PER YEAR BY CHANGING TO ONE MAGNUS CLEANING COMPOUND!" — An oil filter manufacturer.

"CHANGING TO A MAGNUS SOLUBLE MACHINING LUBRICANT EXTENDED TOOL LIFE UP TO 80%." — A Michigan machine shop

"CUT MACHINE DOWN-TIME FROM 3 HOURS A WEEK TO 3 HOURS A MONTH OR LESS." An aircraft engine and accessory manufacturer.

"MAGNUS CLEAR COATING COMPOUND REPLACED ANODIZING, CUTTING UNIT COSTS FROM $2.00 TO 25¢." — An aluminum products manufacturer.

These are only a few of the real results produced by the application of effective economical Magnus Methods.

FREE! Send for Case Histories and Survey Form

Your local Magnus Representative will survey and recommend — without obligation — methods to speed, improve and cut costs in your individual operation.

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CHEMICAL COMPANY INC
11 South Avenue, Garwood, N. J.

Please send FREE case histories and survey form.

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POSITION _____
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BUSINESS ITEMS

Bobilin Joins Imperial Industries

Robert H. Bobilin

Robert H. Bobilin has joined *Imperial Industries, Inc.* of Wayne, Mich., fabricators of plastics for industrial and commercial use. Mr. Bobilin's former associations include the Udylite Corp. and F. B. Stevens Co. He brings to his new position a wide executive and engineering experience in the electroplating and chemical processing fields.

Diversey Names Stark Division Manager

The *Diversey Corp.* has named *Malcolm R. Stark* office manager of the company's southern division headquarters in Atlanta, Ga. Since 1958 he had been a divisional sales correspondent with the Cleveland division.

M&T Adds to Organic Chemical Research Staff

Gus Martin has joined the organic research group at *Metal & Thermit Corp.'s* research laboratories in Rahway, N. J.

Mr. Martin received his B.S. in chemistry from Iowa State University, and has taken graduate study at North Carolina State. He is a member of the American Chemical Society.

Hanson-Van Winkle-Munning Signs Licensing Agreement with Large British Manufacturer

Hanson-Van Winkle-Munning Co., a major U. S. manufacturer of metal finishing equipment, processes and supplies, has announced that it has signed a licensing agreement with *Albright & Wilson (Mfg.), Ltd.*, of Oldbury, England, for the manufacture and sale in the British Commonwealth and certain European countries, of the firm's complete line. Under the terms of the contract, Australia, Canada, Hong Kong and New Zealand are excluded.

New Industrial Equipment Firm

H. D. Erickson and *E. G. Albert*, formerly with L. J. Land, Inc., have formed *Reading Industrial Equipment Co., Inc.*, specializing in new and rebuilt electrical and mechanical industrial equipment. The firm's address is P.O. Box 765, Reading, Pa., telephone WAlker 9-5717.

Stevens Appoints Manquen

The appointment of *John W. Manquen* as technical director for the Metal Finishing Division of *Frederic B. Stevens, Inc.*, Detroit, was announced recently. He will head the recently expanded customer service laboratory and product development facilities located in the headquarters building at 1800-18th St., Detroit.

John W. Manquen

Mr. Manquen was formerly employed by the Udylite Corp. for 15 years as a research chemist. He holds a BChE degree from the University of Detroit, class of 1944. He was a member of the United States Army and served in the European Theatre of Operations.

He is a member of the Detroit Branch of the A.E.S. and the Detroit Astronomical Society.

Pennsalt Appoints Geiger

Pennsalt Chemicals Corp. has announced the appointment of *Linwood T. Geiger* as plant manager, Delaware, Ohio. He has been acting manager since November 1, 1960.

Geiger joined the firm as a production trainee in 1955. He has since held positions as assistant to the production manager, Chemical Specialties Division; control accounting supervisor, Cornwells Heights, Pa. and financial manager at Chicago Heights, Ill.

He was graduated from the University of Pennsylvania and served as a Lieutenant (jg) in the U. S. Navy during World War II.

Waalkes Elected to Alert Supply Board

Alert Supply Co., Los Angeles and San Francisco, has announced the election of *Paul A. Waalkes* as a director and appointment as a vice-president. He continues to be sales manager of the company, and he had previously been assistant general manager of the J. C. Miller Div., *Hanson-Van Winkle-Munning Co.*, Grand Rapids, Mich.

New Sales Engineers Appointed by Industrial Filter

Richard W. Crain and *John R. Barone* have been appointed sales engineers for *Industrial Filter & Pump Mfg. Co.*, Cicero, Ill.

Mr. Crain has been associated with the firm since 1953 in various positions, principally those involving research and development. He has worked on the company's filtration design projects as well as on water and waste treatment problems. He is a graduate

Richard W. Crain

which stack would YOU use for corrosive fumes?
8888-CC
This stainless steel stack failed after only 6 months in corrosion service!
Over 2 years old . . . yet this Duracor stack shows absolutely no signs of attack inside or outside!

DURACOR VENTILATING SYSTEMS PROVIDE LASTING CORROSION RESISTANCE AT LOW COST!

Performance-proven Duracor Ventilating Systems and components provide outstanding resistance to attack from all types of corrosive fumes. These high-strength systems are corrosion-proof throughout . . . are practically immune to weathering . . . require only minimum support! Best of all, Duracor construction can save you up to 30% on your initial investment . . . and it's maintenance-free! Ceilcote engineers will design a complete Duracor system to meet your special requirements . . . or modify your present system to permit gradual conversion to Duracor. Fabricated to meet customer specifications . . . or assembled from stocked component parts . . . Duracor Ventilating Systems can be easily installed by regular plant maintenance crews or by experienced Ceilcote installation personnel. Write today for the new Ceilcote catalog.

DURACOR CEILCOTE

ANOTHER PRODUCT OF

THE CEILCOTE COMPANY, INCORPORATED

4844 Ridge Road • Cleveland 9, Ohio

John R. Barone

of Western Illinois University, with a B.S. in chemistry and has worked on his M.S. at Notre Dame.

Mr. Barone joined the company in 1959 and has worked in the firm's sales department exclusively. He attended Mount St. Francis and St. Anthony's Colleges in Indiana, and is married.

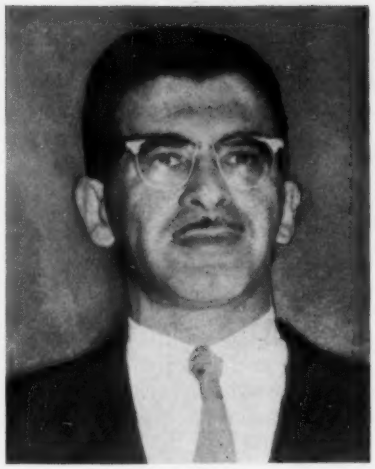
Both men will work out of the firm's home offices.

Friedman New Manager at Vernon Plating Works

Isidore Friedman has joined the *DeJur-Amsco Corp.* as manager of the Vernon Plating Works, Woodside, L. I., a subsidiary. He comes to his new position from the E. C. Electroplating Co., Garfield, N. J. where he was employed as technical director and manager of the Precious Metals Plating Division. There he gained an extensive background in precious metal plating for the electronics field, particularly in regard to the plating of transistor headers, diodes, and the like.

Prior to this, Mr. Friedman had been the head of the plating and surface treatments unit of Wright Aeronautical Division, Curtiss Wright Corp. He was involved in the development of procedures for plating on molybdenum and titanium, holding a patent on the latter. He was instrumental in the introduction of the sulfamate bath for low stress nickel plating to the aircraft industry. All areas of plating for engineering applications came under his surveillance.

A Graduate of C. C. N. Y., Mr. Friedman served with the Army in



Isidore Friedman

World War II. He is an officer of the New York Branch of the A.E.S.

McGean in New Offices

McGean Chemical Co. has moved its general offices to 1250 Terminal Tower, Cleveland 13, Ohio. The telephone number remains MAin 1-6425.

Guaranteed Buff at New Location

Guaranteed Buff Co., Inc. announces

for the "Solution to your Plating Problems" .... come to

JELCO

Get the Brightest Nickel ever — right out of the barrel!

BARREL NICKEL Brightener

Can be used in your present regular solution with standard equipment

- **Maximum brightness — with minimum solution control**
- **Single addition agent**
- **For use in Hot or Cold solutions**
- **Highly ductile deposits — excellent throwing power**

A Proven Process!

Used successfully by job platers and manufacturers

NON-CRITICAL BOOSTS PRODUCTION CUTS REJECTS

One of America's leading manufacturers

- BRASS Additive
- COP-BRITE
- BARREL COPPER Brightener
- BARREL NICKEL Brightener

For technical information, complete details and prices ... write to

JELCO Finishing Equipment Corp.

153 East 26th Street, New York 10 • Phone LExington 2-3055

the removal of its plant and offices to new and larger quarters at 116-132 Nassau St., Brooklyn 1, N. Y. The telephone number is TRiangle 5-4600.

Fidelity Chemical Appointed Distributor for Curtiss-Wright Ultrasonic Cleaners

Fidelity Chemical Products Corp. of Newark has been appointed as a distributor to electronic and industrial concerns for the Curtiss-Wright line of ultrasonic cleaners. Field demonstrations of the units may be had by contacting the company at 470 Frelinghuysen Ave., Newark 12, N. J.

S. F. Lawrason & Co. Ltd., now Associated with Kelite

S. F. Lawrason & Co. Ltd., an old and well established Canadian chemical manufacturing and distributing firm in London, Ontario, will handle manufacture and sale of *Kelite Corp's* chemical compositions and the distribution of equipment in the Provinces of Ontario, Quebec, Nova Scotia, New Brunswick, and Prince Edward Island.

At its London, Ontario headquarters, Lawrason operates a fully equipped factory, with a modern laboratory for production control and technical service. It also has manufacturing and sales facilities in Toronto and Montreal.

Appointments at Richardson-Allen

Hugh A. McCloskey, a former vice-president for operations, Hammarlund Mfg. Co., Inc., has become general manager of *Richardson-Allen Corp.* A graduate of Manhattan College, Mr. McCloskey was associated with Hammarlund for fifteen years, and most

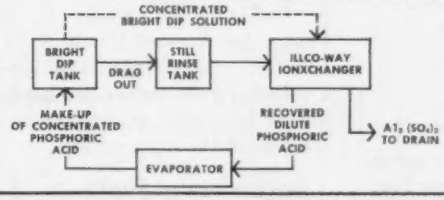
Don't throw it away! **RECOVER YOUR ALUMINUM BRIGHT DIP SOLUTION**

ILLCO-WAY ionXchange

SPECIALIZED EXPERIENCE SHOWS HOW TO SAVE MONEY

The use of ion-exchange eliminates the need for dumping expensive phosphoric acid. Four years of successful experience in recovery of bright dip solutions enables us to make several recommendations, depending on particular conditions. Usually, we employ a cation exchanger to purify the first rinse, recovering phosphoric acid which has been carried over from the bath by dragout. Another treatment removes aluminum direct from the bath. The use of IWT ionXchange can not only improve the uniformity of your product through better quality control in the plating, but also can be a very *profitable* investment.

PROCESS CAN BE USED IN SEVERAL WAYS



The block diagram at the left illustrates the general methods of treatment suggested above. Actually, every installation presents its own special problems — which IWT engineers are well-equipped to solve. *So, consult your IWT representative for specific suggestions.*

ILLINOIS WATER TREATMENT COMPANY

840 CEDAR STREET
ROCKFORD, ILLINOIS

NEW YORK OFFICE: 141 E. 44th St., New York 17, N.Y.
CANADIAN DIST.: Pumps & Softeners, Ltd., London, Ont.

Hugh A. McCloskey

J. J. Rheinhold

Sol W. Berman

recently in charge of building, staffing and training personnel for their plant at Mars Hill, N. C. He has also been a progress superintendent for the Maritime Div. of the Sperry Gyroscope Co., and handled budgetary cost control on fabrication of airplanes for the Chance-Vought Div., United Aircraft Corp. Mr. McCloskey is a past president of the Electronic Mfrs. Assn., and a founder and charter member of the Electronic Personnel Assn. He has also assisted E.I.A. representatives in Washington on excise tax legislation.

J. J. Rheinhold, formerly sales manager, was moved up to the post of director of sales. The company also named *Sol W. Berman* to the post of chief engineer.

Berman is a veteran of eighteen years in the rectifier industry. He has served as a divisional sales manager for the Electric Regulator Corp. of Norwalk, Conn., as chief engineer for the Walker Div., Norma-Hoffman Bearings Corp., Stamford, Conn., and vice-president in charge of engineering, W. Green Elec. Co., Inc. Mr. Berman was active in the organization of Nema Metallic Rectifier Section and served as Chairman of the Definitions Committee. During World War II, he was with the U. S. Signal Corps, Radio Intercept Company.

Stevens Expands in Buffalo

Frederic B. Stevens, Inc., has moved its Buffalo plant and warehouse from 93 Stone St., where it was located for 26 years, to 597 Northland Ave. The new buildings contain more than 25,000 square feet of warehousing space and will enable the firm to make shipments of foundry and metal finishing supplies direct from inventory.

Also featured in the new facility is a highly efficient method of grinding and bagging seacoal that will permit greater quality control.

Synflex Div. of Moore Appoints Distributor

The Synflex Products Div. of *Samuel Moore & Co.*, Mantua, Ohio has appointed N. L. Kuehn Co., 3747 N. Booth St., Milwaukee, Wis.; and Syracuse Supply Co., Syracuse 1, N. Y., as authorized distributors of their line of hoses.

Rinshed-Mason Buys Controlling Interest in French Paint Firm

Rinshed-Mason Co. has announced the purchase of a controlling interest in *Etablissements Weeks S. A.* of France by *Rinshed-Mason S. A.* of Lausanne, Switzerland. The latter is a wholly-owned subsidiary and was formed to handle all international operations of the corporation.

Etablissements Weeks S. A., a French paint manufacturer, was founded in 1888 with headquarters in Paris and two manufacturing plants at St.-Just-En-Chaussée (Oise), France and has been supplying automotive and industrial paints throughout the world under the name Vit-Lak.

Taubel Joins Claremont

Claremont Pigment Dispersion Corp. announces the appointment of *Eugene Taubel* to its technical sales staff serving the New York and Connecticut area.

Because of his lengthy experience in the plastics field, Mr. Taubel is extremely well qualified to provide technical service to customers in all branches of the industry.

MacDermid, Inc. Appoints Research Chemist

Edmund Horner has been appointed research chemist by *MacDermid Inc.*, Waterbury, Conn., manufacturer of metal cleaning, plating and finishing chemicals. He has been assigned to the research laboratory in the Waterbury plant. Mr. Horner was previously employed by the Oakite Co., first in the

Edmund Horner

DEPENDABLE PPI PRODUCTS

- RUBBER AND PLASTIC DRUM LINERS
- MONEL, STEEL, COPPER AND TITANIUM ANODE HOOKS
- PLASTIC COATED PAILS AND DIPPERS
- POLYETHYLENE TANKS AND PAILS
- TITANIUM ANODE SCRAP SAVER BASKETS
- TITANIUM HEATING COILS
- TRICHLORETHYLENE
- PERCHLORETHYLENE
- SILVER BRIGHTNER
- SWIMMING POOL CHEMICALS
- OIL ABSORBENT
- ACID TANKS AND CONTAINERS
- HAND CHEMICAL PUMPS

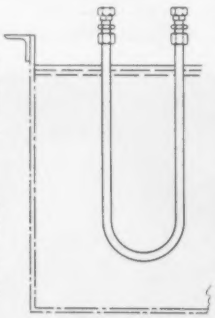
Maintenance - Free

TITANIUM HEATING COILS

Standard Titanium Heating Coils are made in U type units with 1" diameter tubing and .028" wall thickness. Special stainless steel fittings are furnished on each coil to connect the steam lines to the heating unit.

ADVANTAGES:

- Considerable lower cost than tantalum.
- More durable because of the use of heavier gage material, .028" over .013" of tantalum.
- Maintenance free because there is no harmful salt built up.
- Coils resist chemical attack in all nickel solutions and non-fluoride chromium solutions and all concentrations and temperatures of nitric acid.
- Many times lighter in weight than lead.
- Many times more durable than lead.
- Does not take up nearly as much space in tank as lead coils.
- Titanium coils can be used in nickel high chloride solutions; whereas, lead coils are objectionable.



Different shapes of coils can be furnished upon request.

Orders Filled Promptly . . . PLACE YOUR ORDER TODAY

PLATING PRODUCTS, Inc.

1509 N. WASHINGTON
KOKOMO, INDIANA

technical service department and later in the research department.

He is a graduate of Polytechnic Institute of Brooklyn with a degree in metallurgical engineering and a member of both the American Society for Metals and National Association of Corrosion Engineers.

Conforming Matrix Moves to New, Larger Plant

Conforming Matrix Corp. has moved into its new plant at 830 New York Ave., Toledo 11, Ohio.

The new quarters occupy 22,500 sq. ft., of which 19,800 are devoted to production, 1,500 to engineering, and 1,200 to offices. Open house for customers and members of the trade press was held Saturday, April 8th.

Spraylat Appoints Sales Rep.

Spraylat Corp., 1 Park Ave., New York 16, N. Y., has announced the appointment of *William A. Kwozalla* as a sales representative in the midwest territory. He is located at 10 St. Jude Circle, Florence, Ky.

Kelite Appoints Ryan Regional Sales Manager

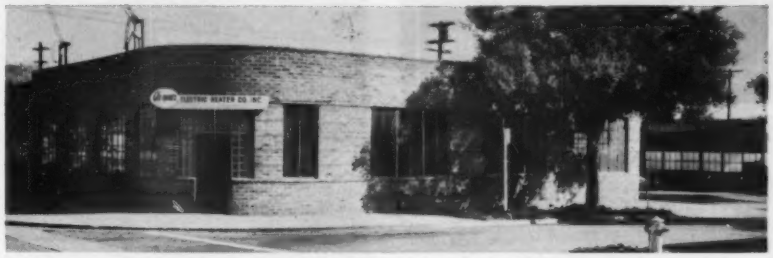
The appointment of *Robert F. Ryan* to the position of regional sales manager for the Midwestern Region has been announced by *Kelite Corp.*

In addition to managing Midwestern Region sales, Mr. Ryan will co-ordinate the technical, internal control, and marketing departments at the firm's Chicago facility where he is senior executive.

Robert F. Ryan

Mr. Ryan received an M. S. degree in organic chemistry from North Dakota Agricultural College.

Glo-Quartz Moves Western Div. Office to Pasadena



Glo-Quartz Electric Heater Co., Inc., has moved it Western Division manufacturing plants. The new location at 188 N. Berkeley Ave., Pasadena 8, Calif., consists of 7,000 square feet. The entire plant is air conditioned and is of brick construction.

Specialized machinery and equipment has been installed for the manufacture of all types of electric heating devices. Also being manufactured at this location is a complete line of quartz and metal immersion heaters and quartz infra red bake ovens.

Dutch Firm Changes Name

L. van der Hoorn's Chemisch-Technische Industrie N. V., of Utrecht, Holland, has changed its name to *Harshaw-Van Der Hoorn N. V.* The Dutch firm has had exclusive license rights on the Continent since 1948 for the plating processes of *The Harshaw Chemical Co.* of Cleveland, Ohio. The change of name results from closer and more extensive cooperation between the two firms.

Plastic Consultants Made Exclusive Representative for Clemens Chemical

Plastic Consultants, Inc., Wantagh, N. Y., has been appointed exclusive United States representative for the *Clemens Chemical Co.*, Brampton, Ont., Canada.

NOW

make calculations directly in solving electroplating problems

No longer need you rely on empirical methods made necessary by previous types of current density cells. With this new Linear Electroplating (Cell) Analyzer, total polarization can be calculated directly. Developed at the Polytechnic Institute of Brooklyn, the Analyzer cell was specifically designed to give linear distribution of current density along the electrode. Thus, calculations can be made from simple measurements. The unit has extensive laboratory and field applications... is extremely useful in the control, development and study of plating solutions.

Fabricated of Plexiglass (II-A) to fine tolerances. The two sides holding the electrodes are opaque, the other two are clear Plexiglass to permit unobstructed observation.

G-7953D LINEAR ELECTROPLATING ANALYZER consisting of Plexiglass cell and cover only **$29.50**

For reference, see J. ELECTROCHEM. SOC. 103 p. 549 (1956). Reprints on request.

New MANOSTAT Linear Electroplating (CELL) Analyzer simplifies current density study in the lab and field

MANOSTAT Corporation 20-26 N. MOORE ST. NEW YORK 13, N. Y.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Candidate for 3rd Vice-President

The *Baltimore-Washington Branch* has presented *E. E. Oberland*, past president, as a candidate for the office of third vice-president of the American Electroplaters' Society. Ed is a chemical engineering graduate of the University of Wisconsin, and has been associated with the Western Electric Company for many years, in Chicago, New York and Baltimore.

E. E. Oberland

He has had a variety of assignments, including supervisory, in the industrial engineering field, and participated actively in the Industrial Management Society, becoming its executive secretary while in Chicago. His present activity, covering eight years in this field, is senior development engineer responsible for planning and development in electroplating, metal cleaning, and organic finishing at the Baltimore Plant of Western Electric. As well as being active in civic affairs in an executive capacity, he has served diligently in the Baltimore-Washington Branch, having been librarian, secretary, vice president, and president, and as a delegate to national conventions. He is presently a member of the editorial board of Plating Magazine.

Blue Ridge Branch

The Branch held its regular monthly meeting March 3, at the Barringer Hotel in Charlotte, N. C. Thirty-three members and guests attended this meeting, the first ever held by the Branch in Charlotte. *Bruce Wallace*, branch president, presided over the meeting.

At the business meeting the president appointed *Ted Boggess*, *Herb Norris* and *Walter Conine* as members of the nominating committee for the 1961-1962 year. They gave a report of their chosen slate of officers at the April meeting.

A discussion was held concerning the sponsorship of student memberships in the AES by the Branch. A motion was made to sponsor ten such memberships. This was approved by vote of the members. These memberships will be given to students who have shown an interest in the electroplating field and who have been nominated by the department head for this honor.

Seven new members were elected. They are: *Marcel Couvoisier*, *Brett*

TAKE THE **LOAD** OFF YOUR **TOP BRASS**

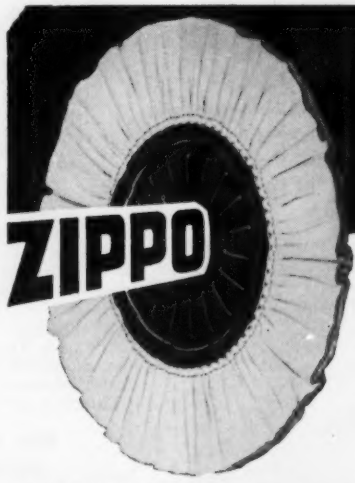
USE **TRUE BRITE BRASS SOLUTIONS**

Trouble Free — Low Cost
Little Supervision Needed
Ready To Use — Just Add Water
Uniform Color — Can Match Colors

Write For Bulletin on Brass Plating

TRUE BRITE CHEMICAL PRODUCTS CO.
BOX 31, OAKVILLE, CONN.

ZIPPO CLOTH BUFFS



- High Count, Heavy Duty, Bias-cut Cloth.
- Extra folds provide wider buff face and greater compound holding capacity.
- Ventilated Steel Centers.
- Perfectly balanced sections require no raking.

FORMAX BUFFS—These famous fast cutting and long wearing buffs continue to set the standard of performance for bias-type cloth buffs. You can depend on uniform quality from shipment to shipment.

Write for Descriptive Literature

FORMAX MFG. CORP.
DETROIT 7, MICHIGAN
"THE FOUR McALEERS"

Wyche, James McSwain, Steve Proco, Leon Holt, David Fineberg and *Walter Conine.*

After the business meeting those attending heard *Dr. A. L. Taylor,* of MacDermid, Inc., speak on "Detergency in Cleaners."

Donald H. McGee,
Secretary

Detroit Branch

The Branch has announced plans for its annual Stag Day to take place at Glen Oaks Country Club in Farmington, Mich. on July 22. Highlights of the event will be a breakfast, golf all day, a steak dinner, floor show, free beer, and the awarding of over $700 worth of door prizes. The number of participants in the 1961 Stag Day is expected to exceed the 750 members and guests in attendance last year.

Stag Day Committee members for 1961 are as follows: General Chairman, *Louis J. Camill;* Food & Drink Chairman, *Roger E. Marce;* Entertainment Chairman, *William Lovell;* Door Prize Chairman, *John F. Siefen;* Ticket & Finance Chairman, *Robert H. Dudley;* Athletic Chairman, *William Lumsden;* and Publicity Chairman, *William G. Anderson.*

Group of golfers ready to tee off at 1960 Stag Day.

William G. Anderson,
Publicity Chairman

Buffalo Branch

The Branch held its monthly meeting on Friday, March 3, at the Niagara Manor, Buffalo, N. Y. with 26 members in attendance. 1st Vice-President *John Donaldson,* called the meeting to order. Following the reading of the minutes and the treasurer's report, *George Wolf,* the Technical Societies' Council representative, reported on the progress of the forthcoming Science Fair.

Mr. Donaldson, chairman of the membership committee, reported a letter was sent to each branch member asking for their co-operation in obtaining new members and that, to date, we have met our 10% increased membership quota.

A motion was made by *Ray Blechinger,* seconded and carried by vote that henceforth the dinner served prior to our monthly meeting will be served on individual request rather than the buffet style.

Librarian *John Tiebor,* introduced the guest speaker of the evening, *Nathaniel Hall,* technical editor of METAL FINISHING magazine.

Mr. Hall with the aid of samples presented a very interesting talk entitled "Electrofabrication — the use of electrodeposition to produce metal objects."

R. Eich,
Secretary

ELECTRO-POLISHING

Fast, low cost finish for aluminum, copper and alloys, steel and stainless steel. Ideal for decorative finishes, burr removal, electroplate adhesion and size control. Standard and custom concentrates nationally available in any quantity.

for Beauty, Economy, Speed

Let us convince you—send samples for processing.

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AGATEEN

Our 34th Birthday, Thank You!

AGATE LACQUER MANUFACTURING CO., INC.
SERVING INDUSTRY SINCE 1927
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Long Island City, N. Y.
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AGATEEN
THE LAST WORD IN QUALITY

Chicago Branch

The Branch held its regular monthly meeting on Friday, March 10th at Petricca's Restaurant, 510 North Western Ave. One application for membership was received and turned over to the board of managers for approval. *Clyde Kelly* gave a report on the interim meeting which was held at Hartford. The National Society is running into a large deficit for the past fiscal year and it is proposed to raise the capita tax from the present $7.50 to at least $11.50 or $12.00, which means a raise in dues for the coming year.

The slate of officers for the coming year were unanimously elected by the members present at the meeting. *Rudy Hazucha*, president; *Joseph C. Corre*, 1st vice-president; *Art Bartman*, 2nd vice - president; secretary - treasurer, *Paul Glab;* librarian, *Charles Geldzhaler*. Board of managers: *Matt Dassinger*, chairman; *Robert Waits*, *Charles Jensen*, *Willard Carter*, and *Christopher Marzano*. Delegates: *Si Gary*, *Paul Glab*, and *Clyde Kelly;* Alternate delegates: *Scott Modjeska*, *Charles Geldzhaler* and *Matt Dassinger*.

The speaker of the evening was *Jack B. Kerr*, finishing engineer with Reynolds Metal Co., who spoke on "Finishing Aluminum."

Mr. Kerr was given a rousing vote of applause for his interesting and informative talk.

Christopher Marzano,
Publicity Chairman

Miami Branch

The meeting of March 17 was presided over by *Duke Dent* in the absence of *Earl Kennedy*. It was voted to accept the invitation to join the South Florida Technical Societies Council, and *Fred Fulforth* was appointed to represent the Branch on the council.

Tony Rotoli was appointed AES representative to the local Chapter of the ASM. A nominating committee was appointed, to bring in a slate of officers for the ensuing year. Appointed were *Jack Craig*, *Walt Donnelly* and *Fred Fulforth*.

All members of the Branch are requested to indicate their preferences as to subject matters that they would like to have covered in the educational sessions, so that the speakers might be given enough time to make the proper arrangements to appear.

A motion made and carried that Ladies Nite be set for the meeting in May. Plans are being formulated for the regular meeting nite to have a dinner for the ladies, with a program that might be educational in nature but be presented in a manner that would be interesting to the girls so that they will insist that the members attend all meetings.

In honor of St. Patricks Day a special collation was served.

Abe Schorr,
Secretary

Dayton Branch

The Branch held its fifteenth annual educational session and dinner dance on Saturday, March 4, at the Hotel Biltmore. AES National President *W. Andrew Wesley* was honorary chairman with *Larry Hadlock*, general chairman and *Robert Fisher*, co-chairman.

Walter Anderson was chairman of the educational session which featured *Dr. Hyman Chessin*, director of research, Van der Horst Corp. of Amer-

20,000 drumfuls say you take no chances...

Cutting corners on rack coating quality subjects a bath to contamination trouble at worst...or incurs short rack coating life at best.

It doesn't pay. Thousands of gallons of plating solution are a costly investment. Operating problems from contamination take their toll in lost production. And saving a few cents per rack at the start turns out to be no saving at all if racks fail prematurely.

ica, Olean, N. Y. whose topic was "Adhesion of Electroplated Metals." *A. H. DuRose*, Harshaw Chem. Co., Cleveland, Ohio spoke on "Plating — Art or Science." *William H. Safranek*, Battelle Memorial Institute, Columbus, Ohio reported on "High Temperature Properties of Electroplates."

The evening festivities included a joint suppliers cocktail party, followed by dinner and dancing.

L. A. Critchfield,
Publicity Chairman

New York Branch

President *Joseph Rembecki* called the Feb. 24 meeting to order at 8:30 P.M. at the Statler. Applications for membership from *William Ventunni, Aracelino Garcia, George Rubin* and *George A. Miller* are to follow regular course. A motion was made and carried to allot $150 for "Old Timers Night," to be held in conjunction with installation of officers on Friday, April 14. President Rembecki appointed *Isidore Friedman* chairman of the committee.

Milton Nadel and *Angelo Amatore* received a rising vote of thanks for the good job done when banquet was cancelled due to the snow storm on that day. They managed to make arrangements very soon without any loss to the Branch treasury. Mr. Nadel reported on the interim meeting held Feb. 11, 1961 at Hartford, Conn. The National Society is seeking an increase in "Per-Capita" tax to cover a deficit on the budget. Milton proposed a 10% cut in salaries and expenses to balance the budget. A committee was set up to study means of balancing the budget.

First nominations for officers were held with these results:

President — *Jack Weiner.*
1st Vice-Pres. — *Arthur Carlson.*
2nd. Vice-Pres. — *Isidore Friedman, Charles Weiner, Daniel Paris.*
Financial Sec. — *Daniel Paris.*
Recording Sec. — *Fred Saras.*
Librarian — *Walter Schwartz.*
Sgt. at Arms — *Herman Borakove, Jordan Manister, Daniel Paris.*
Sec.-Treasurer — *Milton Nadel, George Herrmann.*
Bd. of Managers — *Joseph Rembecki.*

Librarian *Martin Pollack* took over for "Good and Welfare," and made the following suggestions to make the meetings more interesting. An Employment Service, A Monthly Publication, and more Question and Answer Sessions. These suggestions started the members going and we had a very interesting meeting, with most of the members present taking an active part.

Fred Saras,
Recording Secretary

St. Louis Branch

The February meeting was cancelled due to a heavy snow fall. The March 7th meeting was a tour of the Cupples Products Corp. plant which started at 5:30 with approximately 90 people present. The tour was arranged by Librarian *G. K. Robins*, through the cooperation of *Milton Lief*, vice-president of the firm, which specializes in aluminum windows and curtain wall building shapes. The guided tour started in the new 140,000 sq. ft. addition just finished and went through the press area, the remelt area, the storage area, the anodizing and hard coating departments.

Ward Kelly,
Secretary

when you have Coating 218X on racks

Twenty thousand drums of outstanding rack coating performance back up every user of Unichrome Coating 218X. Here is the original, heavy duty vinyl plastisol rack coating. What better proof of quality and satisfactory service than those million gallons, covering millions of racks?

The best quality is your greatest economy in the long run. Be sure to have a nearby applicator coat *your* racks with Coating 218X. Ask for names. Or do it yourself if you have baking facilities.

M&T COATINGS & FINISHES

METAL & THERMIT CORPORATION
General Offices: Rahway, N. J. • In Canada: M&T Products of Canada Ltd., Rexdale, Ont.

Cincinnati Branch

Annual elections were held during the March meeting. The officers for the coming year are: *Gerard H. Poll, Jr.*, president; *Charles Dumont*, 1st vice-president; *Robert L. Winston*, 2nd vice-president; *Richard K. Evans*, librarian; *Gordon T. Speers*, treasurer; and *David L. Kaplan*, secretary. *Bill Stephenson* and *John Stary* were appointed to the auditing committee. *Clyde Seymour* reported that the Annual Picnic will be held at the Farm on Anderson Ferry Road, August 19, from 1-10 P.M. and the cost for tickets will be $4.00.

Walter Helbig of Atlas Powder Co. discussed activated carbon, its manufacture and uses. The discussion closed with a question and answer period.

The group adjourned to the social hour sponsored by the McGean Chem. Co., *Alan Klonne* as host.

David L. Kaplan,
Secretary

Newark Branch

First Vice-President *Al Korbelak* called the Mar. 17 meeting to order at 8:45 p.m. with about 85 members and guests present. Among the visitors were *Clarence Sample* and *Milton Nadel* from the New York Branch, and *Gil Stavri* and *John Noel* from Paris.

One application was received and three were elected to membership. They were *G. M. Vingara* of Sel-Rex Corp.; *J. Tomko* of Anodizing Corp.; and *R. E. Krueger* of Towne Laboratories.

On committee reports, *Cy LaManna* stated that the next meeting is Ladies Night and that we would have a mentalist to amuse us. *Fred Meyer*, chairman of the nominating committee, presented the following slate of officers who were elected for the 1961-62 term: President — *Al Korbelak;* First Vice-President — *John Kosmos;* Second Vice-President — *Cy LaManna;* Treasurer — *George Wagner;* Secretary — *Don Foulke;* Librarian — *Eugene Wagner;* Sergeant-at-Arms — *Mario DiChiara;* Board of Managers — *Austin, Grigat, Meyer, G. Reuter* and *Bittrich;* Delegates — *Foulke, Wesley* and *Wagner;* Alternate Delegates — *Grigat, Korbelak* and *LaManna.*

Gustav Bittrich,
Assistant Secretary

Southeastern Branch

The Branch held its regular monthly meeting on March 10, at the Pig-N-Whistle in Atlanta, 43 members and guests attending, *Bruce Taylor* presiding. The attendance was one of the largest recorded for a regular monthly meeting. *H. R. Stogner* reported the success of the 3rd Dixie Regional, and *Clem Hohner*, national committee chairman for 1966, announced the selection of the Fontainebleau Hotel, Miami Beach, as the convention site.

E. L. Gabel of Allied Research Products, Inc. presented a detailed talk on the variables in cyanide zinc plating, illustrated with slides. *Robert E. Gueder*, of the same company, briefly reminisced on the evolution of the art/science of electroplating.

H. R. Stogner,
Secretary

Phoenix Branch

The Branch sponsored the Second Annual Metal Finishing Symposium at Arizona State University on March 25. A most interesting and varied series of subjects were presented relative to

STUTZ BALL ANODE CONTAINER

New Construction for longer Service . . .

STUTZ CONSTRUCTION

Heavy gauge steel with wire woven through steel angle firmly attached to main stem. Cannot come apart or loosen. Side clip is for STUTZ BARREL PLATING TANKS having submerged rectangular anode bars. Side clip not furnished for racked plating tanks unless specified. Standard hook 6 inches. Other hook lengths available, however deliveries could be delayed.

WELDED CONSTRUCTION

Note how welds have dissolved or broken in use. Often caused in barrel plating where currents are high and barrel transfer is rapid.

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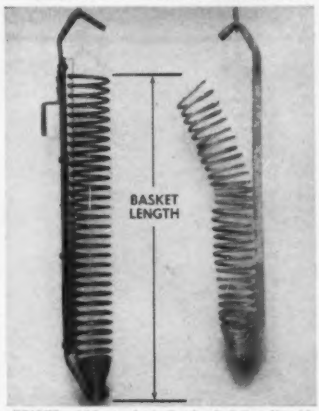

PRICES—12¢ per inch for basket lengths 18 inches or longer in increments of 3 inches. Side clips 15¢ extra. Shorter containers available at 18" price. Curved containers one size only, 27" for 14" and 16" diameter barrels 15¢ per basket additional.

The **STUTZ** Company

Complete Metal Finishing Equipment & Supplies

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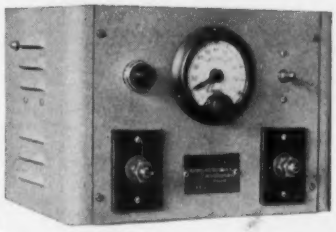
SAVE PRECIOUS METALS and PRECIOUS TIME with MACARR AUTO-TIMING CONTROL



How It Works:

Connect in the cathode line, plug into 115V AC source, set timer, and put MACARR PMC "on" — Insertion of work on cathode rod of any amperage between 2 and 150 will automatically start timer, will time for preset interval. Simultaneously at this point a visible and audible alarm operates; also current to work is automatically reduced to a level where it is not plating or deplating. Removal of work resets PMC and it is ready for next load without the operation or manipulation of any switches.

PMC-150 Model—2-120 second time range with 2A to 150 current rating. Other models available with special time and current ranges.

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metal finishing. The schedule of talks was as follows:

Copper Plating from Cyanide Baths. *Elburn Marcum*, Electrochemicals Dept., E. I. duPont de Nemours & Co., Los Angeles.

Some Aspects of Air-Agitated Nickel Plating. *William Lidtke*, L. H. Butcher Co., Los Angeles.

Chrome Plating Up-To-Date. *Gene Combs*, Diamond Alkali Co., Cleveland.

Defining and Establishing Metal Finishing Quality Standards. *E. E. Kirsch*, General Electric Co., Computer Dept., Phoenix.

Costing and Pricing Metal Finishing Production Jobs. *Willard Bell*, Chemresearch Co., Phoenix & Los Angeles.

Control of Metal Finishing Quality. *Jack Beall*, Crown Chem. and Engr. Co., Los Angeles.

Paul M. Wible

Rochester Branch

The March 6th meeting of the Rochester Branch was called to order by President *John Cipolla*. Several reports were given on the Branch's 50th Anniversary Celebration combined with the 7th Annual Empire State Regional Meeting, to be held at the Manger Hotel on May 5th and 6th.

After the business meeting, librarian *Loring F. Carson* introduced the speaker of the evening, *F. W. Arndt*, chief engineer of the Heil Process Equip. Corp. His topic "Corrosive Fume Ventilation Equipment" was very complete and informative. Mr. Arndt illustrated his talk with several slides and added just enough humor to hold the attention of all present.

Peter VanDilst,
Secretary

Los Angeles Branch

Emmett H. Babcock, a process engineer with Convair, Inc., Pomona, Calif., was elected president of the Branch at the March 8 meeting in Rodger Young Auditorium, Los Angeles. *Harvey K. Hunt*, a sales engineer with Alert Supply Co., Los Angeles, was elevated to the first vice-presidency from the position of second vice-president. *Don E. Baudrand*, operator of Baudrand Laboratories in Los Angeles, was elected second vice-president; *Harold Wanamaker*, owner of Avalon Deburring Co., El Monte, secretary; and *Gene Bosl*, Alert Supply Co., educational chairman. The new board of managers is composed of immediate past-president *Frank Virgil*, chairman, plus *Norman Painter* of Hall-Mak Co., and *Truman Stoner* of Chief Products Co. Installation was held on April 12 at which time also the new sergeant-at-arms, chairmen of the research and publicity committees,

Emmett H. Babcock

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and co-members of the educational committee were appointed.

Vice-president Babcock, presiding in the absence of President Virgil, announced that arrangements had been concluded to hold the June 14 general meeting (last before summer recess) as a joint session with San Diego Branch. Rodger Young Auditorium, Los Angeles, where Los Angeles Branch holds its monthly sessions, will be the site of the joint meeting.

Charles Williams of Mefford Chemical Co. was initiated into membership and an application was received from *George Garcia* of the Specialized Plating Co.

Invitations for Los Angeles members to attend three west coast plating conferences scheduled to be held in March and April were extended: by *Harold Smallman* in behalf of San Francisco Branch's annual educational session on March 11; by *Emmett H. Babcock* in behalf of Phoenix Branch's plating symposium March 25; and by *Harold Wanamaker* in behalf of Los Angeles Branch's annual educational session on April 8.

"Plating on Difficult-to-Plate Basis Metals" was the subject presented during the educational session conducted by Chairman Baudrand of the educational committee, following the close of the business meeting. Baudrand introduced *A. D. Squitero*, an engineer affiliated with the development and research division of International Nickel Co., Inc., of New York. This topic had placed high on the technical subject poll conducted by the branch last year to determine what technical subjects the members preferred to hear an address on.

His talk included analyses of plating, cleaning and other preplating processes for stainless steel, high nickel alloys, aluminum, magnesium and molybdenum. He also discussed metals that require extra treatments, such as zirconium, vanadium and beryllium.

Fred Herr

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MASTERS' ELECTRO-PLATING ASSOCIATION, INC.

The forty-third annual banquet and entertainment will take place on Saturday, May 27, 1961 at the Grand Ballroom of the Plaza Hotel in New York City.

Dress is optional, with reception and cocktails starting at 6:30 p.m. Tickets, at $25.00 per person, are available at the Association's offices, 59 E. 4th St., New York 3, N. Y.

Banquet chairman is *Walter Turner* and the vice chairman is *L. A. Kornblum. Charles R. Leva* has been named chairman of the executive board for 1961.

AMERICAN HOT DIP GALVANIZERS ASSN.

The Association, with the cooperation of the American Zinc Institute, has announced that ten awards of $1,000 each will be offered for ideas developing new applications and markets for hot dip galvanizing. Each award will be accompanied by an appropriate medal and a certificate of achievement.

AMERICAN ZINC INSTITUTE

The Institute has just moved its Detroit headquarters to new and expanded facilities, situated at 638 New Center Building, Detroit 2, Mich.; the phone number is TRinity 2-2850. *James E. Zane* will continue in charge of the expanded facilities.

PORCELAIN ENAMEL INSTITUTE

This striking QV — quality-verified — emblem will appear on architectural porcelain enamel products manufactured by members of the Quality Verification Council of the *Porcelain Enamel Institute.*

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The black and persimmon-colored labels indicate that the products meet rigid specifications for thickness, continuity and weather-resistance.

Under a program established with the sponsorship of the Institute's architectural division, plants of member companies of the Quality Verification Council will periodically undergo unannounced inspections by an independent consultant.

Manufacturers' Literature

Metallic Fluoborates

Harstan Chem. Corp., Dept. MF, 1247 38th St., Brooklyn, N. Y.

Several technical bulletins give the properties and applications of the metallic fluoborates. Full details and preparation instructions are included.

Chromate Conversion Coatings and Cyanide Zinc Plating

Allied Research Products, Inc., Dept. MF, 4004 E. Monument St., Baltimore 5, Md.

"Technical Data Chart on Chromate Conversion Coatings" presents a general discussion of the purposes for which these coatings are used. In addition, the inside two pages of the four-page folder feature a chart presentation of all the various Iridite coatings available. This chart indicates what metals they may be applied to, salient features, typical applications, applicable specifications, methods of applications and salt spray resistance.

An eight-page discussion entitled "Practical Cyanide Zinc Plating" presents a complete discussion of this subject.

Electroplating Processes

Hanson-Van Winkle-Munning Co., Dept. MF, Church Street, Matawan, N. J.

This 24-page, two color new bulle-

tin, EP-103, is an expansion of EP-102 issued last year. Nineteen plating and other metal finishing processes and procedures are described. Solution preparation, type of deposits, operating conditions, equipment required, and applications are listed for each of the processes.

The company's laboratory, testing and field services available to customers are illustrated and described.

Chemical Specialties

MacDermid, Inc., Dept. MF, Waterbury 20, Conn.

A newly revised index of compounds for finishing aluminum, Technical Data Sheet No. 24 lists a full range of aluminum finishing processes, including compounds used in anodizing, bright dipping, burnishing and barrel finishing, chemical milling, chromate conversion coatings, cleaning, corrosion protection, deburring, deoxidizing, electropolishing, pickling, plating, pre-painting treatment, rinsing and drying, spot welding, stripping and surface activation.

Metex M-662, a new deoxidizer for aluminum which is free of chromic and nitric acid and presents no waste disposal problems is fully described in Technical Data Sheet No. 117.

Metex Rust Retardant M-638, a new rust retardant finish which can be applied to steel to prevent corrosion during manufacturing and storage is fully described in Technical Data Sheet No. 125.

New Etch Resist for Printed Circuits

Meaker Co., Sub. Sel-Rex Corp., Dept. MF, Nutley, N. J.

Properties and advantages of Resist-Etch are described in a 4-page technical booklet.

Semi-Automatic Polishing Machines

Acme Mfg. Co., Dept. MF, 1400 E. Nine Mile Road, Detroit 20, Mich.

A new 20-page, two color, 8½ by 11-in. illustrated catalog describes a complete line of semi-automatic machines for low production deburring, buffing and polishing operations; and newly developed accessories and attachments for increasing efficiency of semi-automatic finishing operations.

Also included in the catalog are 12 special semi-automatic polishing and buffing machines designed for specific application requirements.

Finishing Equipment

Singleton Co., Dept. MF, 11770 Berea Road, Cleveland, Ohio.

This new brochure highlights a wide variety of high-performance original and replacement plating cylinders, superstructures, tanks and components to fit its own and all makes of barrel equipment. Featured are the latest plating barrels, single or multiple station, cogged-V-belt or gear drive. Included are loading stands, chute loaders, unloaders, etc.

Rust Remover

E. F. Houghton & Co., Dept. MF, 303 W. Lehigh Ave., Philadelphia 33, Pa.

"Rust Remover 3503" data sheet describes a product that removes rust, gives iron phosphate coating, cleans light soil.

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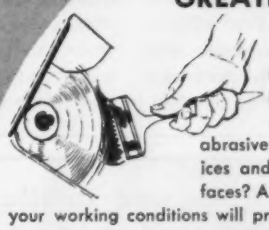

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Drying Solvent Process

Phillips Mfg. Co., Inc., Dept. MF, 3475 W. Touhy Ave., Chicago 45, Ill.

Information concerning the newly patented Trisec process is available in Bulletin 24.

Method of operation and detailed photographs showing striking comparisons between conventional drying methods and the new process are included in the bulletin.

Engineering of Corrosion-Proof Floors

Ceilcote Co., Dept. MF, 4832 Ridge Road, Cleveland 9, Ohio.

A group of design drawings and specifications for corrosion-proof engineered floors includes a guide to selecting acid-proof cements. The new literature package consists of nine detailed drawings of typical engineered flooring installations and specification sheets describing the thirteen elements generally utilized in corrosion-proofing.

Hot Tinning

Leon J. Barrett Co., Dept. MF, Worcester, Mass.

A new brochure contains facts about centrifugal tinning, specifications, descriptions and application data for a complete line of tinners.

Cloth Polishing Wheels

Divine Bros. Co., Dept. MF, 203 Seward Ave., Utica, N. Y.

This four-page, illustrated brochure includes descriptions and specifications of general-purpose Clothflex wheels, specially-bonded Superflex wheels and patented Non-Streak models. Bushings and balancing tubes for extending wheel life also are covered in the condensation.

Paint Mask Washers

Conforming Matrix Corp., Dept. MF, 780 New York Ave., Toledo 11, Ohio.

Five automatic machines for washing masks used in spray paint decoration are described in a new brochure.

Wide Belt Polishing

Carborundum Co., Dept. MF, P. O. Box 337, Niagara Falls, N. Y.

"Wide Belt Finishing" recites case study results where use of wide belts and wide belt machines cuts costs and expedites production while maintaining quality.

Spray Nozzles

Spraying Systems Co., Dept. MF, 3245 Randolph St., Bellwood, Ill.

Bulletin 106 describes a complete line of spray nozzles and accessories specifically used in the metal finishing field. Reference chart lists applications and types of nozzles used. A complete spray nozzle reference manual on washing, rinsing, fogging or wetting, coating and related operations.

Demineralizers

Barnstead Still and Sterilizer Co., Dept. MF, 2 Lanesville Terrace, Boston 31, Mass.

Bulletin #154 introduces a complete line of disposable cartridge-type water demineralizers. Also shown are interchangeable standard cartridges, mixed resin cartridges, oxygen removal cartridges, organic removal cartridges and cation cartridges.

Selective Plating

Selectrons, Ltd., Dept. MF, 520 Fifth Ave., New York 36, N. Y.

A four-page booklet SP-1003, lists varied industrial uses and advantages of a new, high-speed selective plating process. The booklet also contains a chart indicating deposition rates, metal concentrations, and recommended current densities.

Wire Baskets

Newark Wire Cloth Co., Dept. MF, 351 Verona Ave., Newark 4, N. J.

New 8-page bulletin B-10 on woven wire baskets for degreasing, dipping, heat treating, plating, pickling, ultrasonic or chemical cleaning, quenching and toting, includes illustrations of all standard basket types and detailed specifications on the wire.

Plating Facilities

Platronics, Dept. MF, 500 Commerce Road, Linden, N. J.

Electrochemical and mechanical facilities available for top quality results in plating electronic components, are described in detail in a new brochure.

Guide to Automation

Meaker Co., Sub. of Sel-Rex Corp., Dept. MF, Nutley, N. J.

A wide range of machines and equipment designed to automate metal finishing operations is described in a fully illustrated 29 page guide.

Chemical Specialties

Fidelity Chem. Prods. Corp., Dept. MF, 470-474 Frelinghuysen Ave., Newark 12, N. J.

A comprehensive catalog contains

INDUSTRY... large and small...
relies on *RANDOLPH*
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Lacquers • Synthetic Enamels • Air-Dry Lacquers
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Zialite
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The one bath especially designed for plating DIRECTLY on ZINC, LEAD, ALUMINUM, BRASS, COPPER and IRON. "TREMENDOUS THROWING POWER."
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Harder CRACK FREE deposits. Increased throwing power. Less sensitivity to sulfate content. Exceptionally fine results plating anything calling for Decorative or Hard Chrome.
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technical descriptions and specifications, and presents directions for use and covers technical data on a variety of chemicals. Described are bright dips and descalers for high nickel alloys, stainless steels, cold rolled steels, copper and brass alloys and a variety of other metals; chemical wire strippers; stop-offs for plating and painting; and paint strippers for epoxys, vinyls, baking enamels and lacquers.

Also included is information on strippable coatings, alkaline metal cleaners, burnishing compounds, and spray booth compounds.

Pre-plated Metals

American Nickeloid Co., Dept. MF, Peru, Ill.

A showing of actual samples of preplated metals having design-rich textured surfaces is featured in a new Crimp Metal Pak.

Also contained in the Pak is a data folder giving table of properties and sheet sizes, gauges and tempers, as well as fabrication information. Data are also given covering rigidity, reflectivity, heat diffusion, and design potentialities in these eye-appeal metals.

Automatic Dust Collector

Automatic Collector Div., Torit Mfg. Co., Dept. MF, 1131 Rankin St., St. Paul 16, Minn.

The special capabilities of a recently introduced automatic dust collector are outlined in literature just issued. Eleven models, their dimensions and filter areas are detailed in an easy-to-read table. A schematic drawing and legend explain the new collector's operation, and photographs depict such components as the unique self-cleaning mechanism.

NEWS FROM CALIFORNIA

Joseph E. Trankla has been named general manager for the California division of Anadite, Inc., whose general offices and plant are at 10630 Sessler St., South Gate, Calif.

Trankla, formerly assistant general manager and director of research and development, is credited with developing a number of new techniques for processing steel, aluminum, and magnesium.

A. D. Squitero, research engineer with International Nickel Co. of New York, made a swing of the California branches of the A.E.S. in March to address them on "Plating Difficult to Plate Base Metals." He addressed San Diego Branch on March 7, Los Angeles Branch on March 8, and was one of the speakers at San Francisco Branch's first annual educational session on March 11.

Mr. Squitero, who is a graduate of Michigan State College, held an impromptu reunion, prior to the Los Angeles meeting, with *Stewart Krentel* and several other old grads of Michigan State; and also with *Myron Orbaugh*, with whom he was associated in one of his first jobs in the finishing industry some 15 years ago.

Designed to serve as a focal point for advanced research and engineering into electro-mechanical, electronic, and broad spectrum weapon systems, construction was started recently by the Nortronics Division of the Northrop Corp., on a $1,700,000 engineering and administration building in Anaheim, Calif.

Ground was broken at 26th and Soto St., Vernon, Calif., for a new 70,000 sq. ft. plant costing an estimated one million dollars for the Paradise Mfg. Co., vinyl plastics fabricators.

Cincinnati Cleaning & Finishing Machinery Co. of Cincinnati, O., has appointed *William A. Vensel* as its western sales manager. Vensel, a prominent figure in both the metal and organic finishing fields in Southern California for many years, has established offices in Pasadena, Calif.

George F. Matacek recently was named district manager of the Bee Chemical Co.'s western division with headquarters in Gardena, Calif.

New electrochemical color coatings and finishes will be featured in what is being referred to as the world's first major all-aluminum office structure to be built by Acme Metal Molding, a subsidiary of Northrop Corp., at 5022 Triggs St., Los Angeles.

It is reported that the 6,800 sq. ft. building will feature various innovations in the use of aluminum shapes and extrusions as well as finishes for them.

Robert L. Solnik has been named chief project engineer of the sample handling systems in the Scientific and Process Instruments Division of Beck-

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New "GOLDEN TACKY" treatment for Cotton or Sisal Buffs
Exclusive with American Buff
Provides firmer buff body • Eliminates loose, frayed fibre ends • Increases buffs ability to hold compound • Makes buffs wear longer and cut harder • Gives better finishing in fewer passes
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man Instruments, Inc., Fullerton, Calif. *Thomas A. Guerin* is the division's new product line manager.

The Cerro Corp. of New York is reported to have reached agreement for acquisition of the assets of the United Pacific Aluminum Corp. of Los Angeles, manufacturers of enameled aluminum sheet and coil. The agreement reportedly has been approved by the boards of directors of both companies.

Harvill Corp. of Los Angeles has announced plans for construction of a $1,300,000 plant on a 7½ acre site at Susana Road and Reyes Ave. in San Pedro, Calif. The new 101,000 sq. ft. facility will be equipped with the latest type of plastic molding and die casting equipment.

The Seventh Electrical Maintenance Conference held March 28, 29 and 30 at the University of Southern California, Los Angeles, attracted an attendance of several hundred plant management, plant engineers, and electrical maintenance personnel from many industries.

The conference was sponsored by the Electrical Maintenance Engineers Association of California. Ways to reduce plant maintenance and operating costs and to save money through efficient maintenance of equipment was the theme. Discussion subjects included "City, County and State Electrical Codes," "Electrical Maintenance Is Here To Stay," "Promoting a Productive Management - Maintenance Climate," and "Industrial Plant Maintenance." There was also a display of electrical exhibits by leading manufacturers.

A unique new nail degreasing and packaging line was recently put into operation in the plant of the Colorado Fuel & Iron Corp., in Pueblo, Colo., which performs four sequential steps on nails, with consequent production cost and time savings. The four operations performed are dewhiskering, degreasing, weighing, and packaging.

The automatic operation includes transporting the nails by conveyor to a point above a tumbling drum into which they are dropped for removal of small pieces of steel, then into a trichlorethylene degreasing bath, and onto a pre-set scale, and the packaging section.

Raymond J. Fallon, sales manager, Metasol Div. of Metalsalts Corp., addressed the last monthly meeting of the Los Angeles Society for Coatings Technology on fungicides in paint, an improved bioassay technique for simulating field performance.

Fallon emphasized the need for a short-time means of evaluating paint films, which he said was a constant problem to industry as it pertains to determining effectiveness of fungicides in coatings with reliable interpretations. He reported that the Metasol Laboratories have developed a system by which a film can be made to experience environments of sun and rain respectively along with the following of a generally weakened condition.

NEW BOOKS

Organic Coating Technology, Volume II: Pigments and Pigmented Coatings

By Henry Fleming Payne. Published By John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 1961. 724 pages. Price $17.50.

The second and final volume of Henry Fleming Payne's treatise on "Organic Coating Technology" is characterized by the same accurate and prolific referencing and logical presentation of data as the first volume. Also, as in the first volume, the author's indulgence in philosophical remarks at the beginning of the book and at the beginning of each chapter has once again demonstrated, as he himself states, that "there is more to

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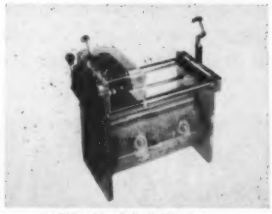

LAZO Model 2-BP-6 . . .
Single Barrel . . . Motorized . . . Portable

Size: 6"x12" inside cylinder dimen.
Size: Overall: 9"x16"x16" high
3/32" Standard Perforations
Any Type Parts up to 3" dia.
All Plating Solutions
Holds up to 15 lbs.

Designed for easy handling. Light in weight. One idler gear for greater efficiency, with fewer moving parts. Acid and alkali resistant driving gears for plus assurance against breakdown. Rubber-covered, corrosion-free truss rods. No special attachments required to adapt these units to present tanks.

Originators of Ribless Plating Barrels

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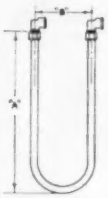
IN STOCK
PURE TITANIUM HEATING COILS
FOR USE IN MOST ACID OR CYANIDE PLATING SOLUTIONS



Coil No.	Eff. Heating Area Sq. Ft.	"A" In.	"B" In.	Price
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Ti-36	1.0	36	12	57.00
Ti-42	1.2	42	12	64.00
Ti-48	1.4	48	12	71.00
Ti-60	1.8	60	12	85.00

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"pH PAPERS"
Accurate pH Values in a few seconds right at the tank.

Indicator AND control-colors on SAME strip. Control-colors in steps of 0.2 pH and 0.3 pH.

Plating ranges
(200 strips of a range per box)

Acid:	Alkaline:
6.0-7.4 pH	6.6- 8.0 pH
*4.8-5.2 pH	7.3- 8.7 pH
*3.6-5.0 pH	8.6-10.0 pH
*2.4-3.9 pH	10.1-11.3 pH
1.0-2.8 pH	10.5-13.0 pH
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Fundamentals of Pigmented Coatings, White Pigments, Extender Pigments, Inorganic Color Pigments, Organic Color Pigments, Black Pigments, Metal Pigments and Metallic Stearates, Principles of Formulation and Production, Preparation of Surfaces and Methods of Application, Architectural Paints, Industrial Finishes, Corrosion-Resistant and Chemical-Resistant Paint Systems.

The book is replete with tables listing such data as the physical and chemical properties of pigments, photographs and drawings illustrating coating processes, and typical formulas for various types of coatings. The book blends theory and practice together so skillfully as to provide a valuable guide to the chemist and formulator and at the same time tell its story in such a way that even a layman can gain much valuable knowledge from its pages. Indeed, this two-volume series is a "must" for the library of any company that formulates or uses organic protective coatings, or any university that presents courses in fields even remotely related to the subject matter discussed by Professor Payne.

Mechanical Polishing

By W. Burkart, H. Silman & C. R. Draper. Published by Robert Draper Ltd., 85 Udney Park Road, Teddington, Middlesex, England. 1960. 255 pages plus index. Price: $9.25, including postage.

Mechanical polishing, abrasive blasting and barrel finishing are subjects which do not lend themselves to detailed exposition, and any publication must limit itself to general treatments of the theory and practice. With an understanding of the fundamentals, the finisher can then proceed to develop his own techniques by trial and error.

The authors describe processes, equipment and materials employed in England, America, and Germany, together with whatever theories have been proposed. Although most of the volume is concerned with metals, grinding and polishing of plastics, lacquers, and other non-metallics are also considered. The latest methods are covered with the help of over two hundred illustrations and, although this is not the book for one interested in formulas which he can follow in order to prepare his own buffing compositions, the supervisor who is desirous of acquiring some familiarity with the subject, and the polisher who wishes to be brought up-to-date, will find it a useful addition to the plant library.

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June 18-23: 48th Annual Convention, A.E.S., Boston Host Branch, Boston, Mass.

June 25-30: Annual Meeting, American Society for Testing Materials, Chalfonte-Haddon Hall Hotel, Atlantic City, N. J.

June 26-27: 5th Annual Conference on Vacuum Metallurgy, American Vacuum Society and New York University, Co-Sponsors, University Heights Campus of N.Y.U., New York City.

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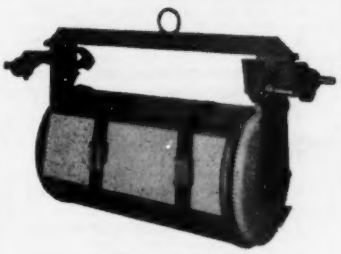

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SITUATION OPEN—Experienced salesman wanted to sell cleaners and everything needed in the plating shop in New York area. Must be a live wire. Address: May 7, care Metal Finishing, 381 Broadway, Westwood, N. J.

SALES ENGINEER

SITUATION OPEN—Sales engineer experienced in sales and installation of automatic, semi-automatic and manual plating equipment. For Midwest territory. Address: May 3, care Metal Finishing, 381 Broadway, Westwood, N. J.

PLATING SUPERVISOR

SITUATION OPEN—Plating specialist, qualified in Production Engineering. Thoroughly experienced in copper, nickel, chrome, silver and gold — barrel, rack and automatic plating of small parts. Trouble shooting, maintenance and handling personnel. Strong working background methods and cost reduction knowledge and rack designing. B. S. degree in chemistry desirable. Permanent opportunity. Long established job shop in New York area. $9,000 start. Address: October 10, care Metal Finishing, 381 Broadway, Westwood, N. J.

PLATER

SITUATION OPEN—Job shop plating foreman. Must be experienced in copper, nickel and chrome on small parts, still and automatic. Must be qualified to supervise department and help solve plating problems. Willing, hard worker. Excellent opportunity for advancement. New York area. Address: October 11, care Metal Finishing, 381 Broadway, Westwood, N. J.

ANODIZER

SITUATION OPEN—Experienced anodizer wanted as lead man in San Francisco Bay area. Must have extensive experience in color anodizing and be able to maintain solutions. Address: May 4, care Metal Finishing, 381 Broadway, Westwood, N. J.

PLATING SUPERVISOR

SITUATION OPEN—Opening exists for plating specialist qualified in the plating of gold, nickel, rhodium, silver, and tin-lead. Must be experienced in trouble shooting, maintenance and handling of personnel. Formal education in chemistry desirable. Location in rural section of central Connecticut. Salary dependent upon qualifications. Address: May 6, care Metal Finishing, 381 Broadway, Westwood, N. J.

SITUATIONS WANTED

PLATING OR TECHNICAL SALES ENGINEER

SITUATION WANTED—Twenty years diversified experience in equipment sales, production, management and technical control of large and small electroplating and heat-treating facilities. Heavy experience in electronic gold and silver plating, automatics, and barrel chrome. Considerable P.E., sales liaison, research and development ability. Desire responsible position in New York City or vicinity. Address: April 5, care Metal Finishing, 381 Broadway, Westwood, N. J.

PLATING & FINISHING SUPERVISOR

SITUATION WANTED—Twenty-five years experience in all phases of metal finishing, buffing, decorative and precious metal plating, anodizing, automatic, plating machines, production and cost control. Metropolitan New York, New Jersey and Connecticut. Address: May 5, care Metal Finishing, 381 Broadway, Westwood, N. J.

PLATING SPECIALIST

SITUATION WANTED—Heavy experience in hard chrome, racks and anode setup, inspection and supervision, quality control, maintenance of equipment, analysis of all plating solutions; with a necessary background in chemistry to work with formulas and make calculations. Experience in silver, gold, industrial and decorative plating, copper, nickel, chrome, zinc, cadmium. West coast preferred. Address: April 6, care Metal Finishing, 381 Broadway, Westwood, N. J.

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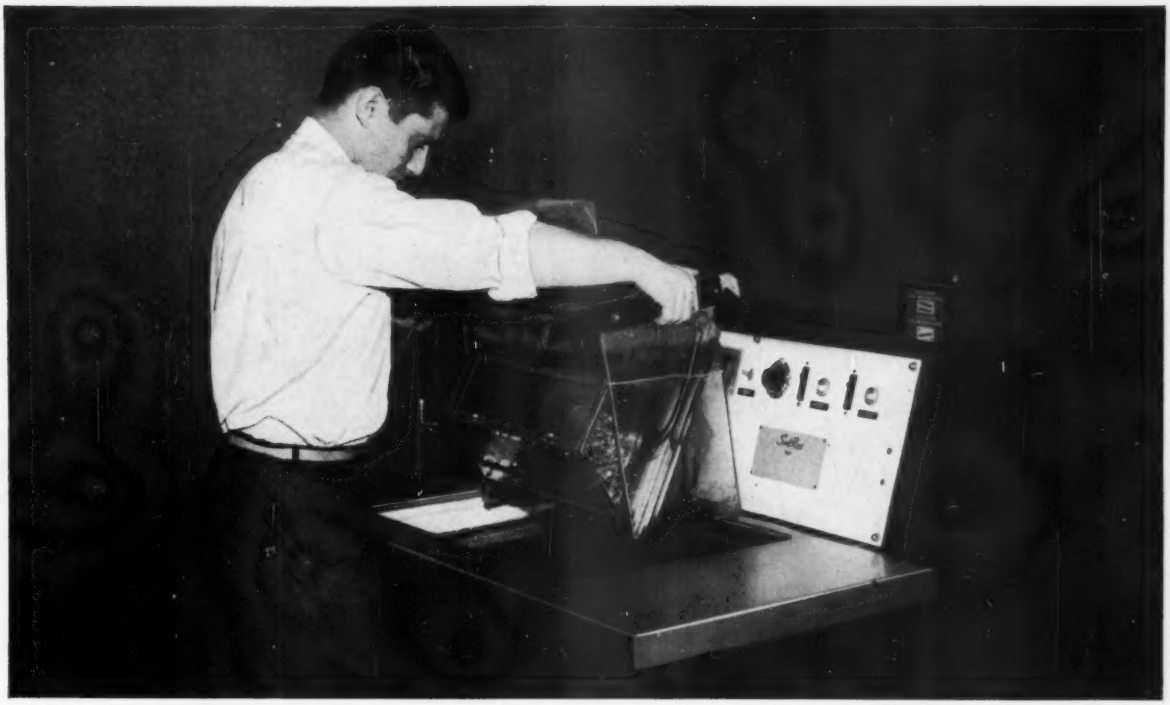

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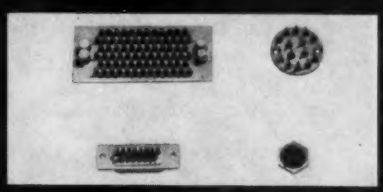

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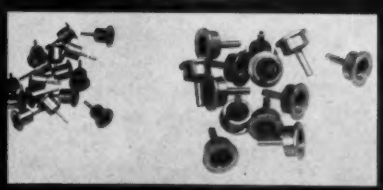

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